

United States  
Department of  
Agriculture

Forest Service



Southeastern Forest  
Experiment Station

Research Paper  
SE-255  
June 1986

# Weight, Volume, and Physical Properties of Major Hardwood Species in the Piedmont

Alexander Clark III  
Douglas R. Phillips  
Douglas J. Frederick



*June 1986*

**Southeastern Forest Experiment Station  
P.O. Box 2680  
Asheville, NC 28802**

Weight, Volume, and Physical Properties  
of Major Hardwood Species  
in the Piedmont

Alexander Clark III, Wood Scientist  
Southeastern Forest Experiment Station  
Athens, Georgia

Douglas R. Phillips, Mensurationist  
Southeastern Forest Experiment Station  
Clemson, South Carolina

and

Douglas J. Frederick, Professor  
School of Forest Resources  
North Carolina State University  
Raleigh, North Carolina



## **Contents**

	<u>Page</u>
<b>Procedure</b>	2
<b>Field</b>	2
<b>Laboratory</b>	4
<b>Analysis</b>	4
<b>Results</b>	6
<b>Physical Properties of Sample Trees</b>	6
<b>Prediction Equations</b>	8
<b>How to Use Prediction Equations</b>	9
<b>Literature Cited</b>	<b>12</b>
 <b>Tables (for hardwood species in the Piedmont)</b>	
1. <b>Mean and range of tree age and measurements, by species and tree size class</b> .....	14
2. <b>Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class</b> . . .....	16
3. <b>Average moisture content of wood, bark, and wood and bark combined, by tree component and size class</b> . . .....	22
4. <b>Average proportion of wood and bark green weight in bark, by tree component and size class</b> .....	27
5. <b>Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class</b> . . .....	29
6. <b>Average green weight of wood and bark per cubic foot of wood, by tree component and size class</b> . . .....	34
7. <b>Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone, with d.b.h. as the independent variable</b> .....	36
8. <b>Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone, with d.b.h. as the independent variable</b> .....	40
9. <b>Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone, with d.b.h. as the independent variable</b> .. . . .....	43
10. <b>Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone, with d.b.h. as the independent variable</b> .. . . .....	45

	<u>Page</u>
11. <b>Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone, with d.b.h. and total height as independent variables .....</b>	47
12. <b>Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone, with d.b.h. and total height as independent variables .....</b>	51
13. <b>Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone, with d.b.h. and total height as independent variables . ....</b>	54
14. <b>Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone, with d.b.h. and total height as independent variables . . ....</b>	56
15. <b>Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone, with d.b.h. and height to a 4-inch top as independent variables .....</b>	58
16. <b>Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone, with d.b.h. and height to 4-inch top as independent variables . . ....</b>	62
17. <b>Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone, with d.b.h. and height to 4-inch top as independent variables ..</b>	65
18. <b>Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone, with d.b.h. and height to 4-inch top as independent variables . . ....</b>	67
19. <b>Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone, with d.b.h. and saw-log merchantable height as independent variables . . . . .</b>	69
20. <b>Regression equations for estimating green and dry weight of saw-log merchantable-stem wood and bark combined and wood alone, with d.b.h. and saw-log merchantable height as independent variables . . . . .</b>	71
21. <b>Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone, with d.b.h. and saw-log merchantable height as independent variables . . . . .</b>	73
22. <b>Regression equations for estimating cubic-foot volume of saw-log merchantable-stem wood and bark combined and wood alone, with d.b.h. and saw-log merchantable height as independent variables . . . . .</b>	74

	<u>Page</u>
<b>23. Regression coefficients for estimating above-stump stem weight to a specified d. o. b. top diameter as a proportion of total-stem weight .....</b>	<b>75</b>
<b>24. Regression coefficients for estimating above-stump stem volume to a specified d. o. b. top diameter as a proportion of total-stem volume .....</b>	<b>76</b>
<b>25. Regression coefficients for estimating stem weight to a specified d. o. b. top diameter as a proportion of saw-log stem weight ...</b>	<b>77</b>
<b>26. Regression coefficients for estimating stem volume to a specified d. o. b. top diameter as a proportion of saw-log stem volume ...</b>	<b>78</b>



## ABSTRACT

**Weight, volume, and physical properties of trees 1 to 20 inches d.b.h. were determined for red maple, sweetgum, sycamore, yellow-poplar, elm, hickory, chestnut oak, scarlet oak, southern red oak, and white oak in the Piedmont of the Southeastern United States. A total of 772 trees were destructively sampled at 16 locations from Virginia to Alabama. Hard hardwoods, soft hardwoods, and individual species equations are presented for predicting green and dry weight and green volume of the total tree above stump and its components by using d.b.h. and total height, d.b.h. and height to a 4-inch top, d.b.h. and saw-log merchantable height, and d.b.h. alone. Average specific gravity, moisture content, and weight per cubic foot of wood, bark, and wood and bark combined are presented for each species by tree size class and component. Bark percentage is also presented for each species by tree size class and component.**

**Keywords:** Biomass, equations, specific gravity, moisture content, bark percentage, weight per cubic foot.



**Piedmont hardwood forests can contribute significantly to supplies of solid wood, fiber, and energy wood through improved utilization and forest management. Few data, however, exist on the weight, volume, and physical properties of the total tree and its components for hardwood species of this region.**

**To meet this need, a southwide study was initiated by the North Carolina State Hardwood Research Cooperative and the USDA Forest Service. The primary objectives of this study were to determine the amount and distribution of biomass in even-aged fully stocked natural stands and to develop equations for estimating the weight and volume of forest stands, individual trees, and tree components. Secondary objectives were to determine the specific gravity, moisture content, and energy potential of southern hardwoods, and to quantify the distribution of nutrients (N, P, K, Ca, and Mg) in individual trees and soils.**

**This is part of a southwide study conducted in three geographic regions--the Gulf and Atlantic Coastal Plains, Piedmont, and mid-South. The data collected in the Gulf and Atlantic Coastal Plains have been reported in earlier publications (Clark**

and others 1983, 1985; Frederick and others 1983; Gower and others 1983; Messina and others 1983). Mid-South data will be presented in later publications.

This Paper presents tree physical properties and green weight, dry weight and green cubic-volume prediction equations for total tree and tree components of 10 species-- red maple (Acer rubrum L.), sweetgum (Liquidambar styraciflua L.), sycamore (Platanus occidentalis L.), yellow-poplar (Liriodendron tulipifera L.), elm species (Ulmus spp.), hickory species (Carya spp.) chestnut oak (Quercus prinus L.), scarlet oak (Q. coccinea Muenchh.), southern red oak (Q. falcata Michx.), and white oak (Q. alba L.) sampled in the Piedmont. These species account for 75 percent of the commercial hardwood volume in the Piedmont regions.

Wood and bark specific gravity, moisture content, bark content, and green weight per cubic foot are presented for the total tree and its components by species and tree size classes. Equations are given for estimating the weight and volume of wood, bark, and foliage, wood and bark and wood only in the total tree, total stem, and the saw-log component of the stem. Ratio equations are also included for estimating total stem and saw-log stem weight or volume to any specified top diameter outside bark (d. o. b.).

#### Procedure

##### Field

Sixteen 1/10-acre circular biomass plots were sampled in mixed, even-aged hardwood stands on the Piedmont (fig. 1). Four age classes (10, 20, 40, and 60 years) were sampled on two site types:

Bottom land. Flood plain areas of major drainage systems and adjacent stream margins, predominantly sandy loam to silt loam surface soils.

Upland (slopes and ridges). Land occupying the large upland interstream divides, predominantly clay to sandy clay loam surface soils.

Age and site combinations were replicated twice. Plots for all ages and site types were randomly located within representative fully stocked stands. Tree data collected on all plots except the 10-year-old plots were used to develop the species equations and properties data reported here. In addition to the fixed-area plots a stratified random sample of three trees per 2-inch class from 6- to 20-inches diameter at breast height (d. b. h.) was sampled at six locations to obtain an even distribution of trees across d.b.h. classes for commercially important species. Figure 1 shows the location of the fixed area and stratified random sample plots.

Data for above-stump total tree and tree component weights and volumes were collected for trees 1 inch d. b. h. and larger. All trees > 5.0 inches d. b. h. on the 1/10-acre plots were sampled. At the center of each plot-a concentric 1/50-acre subplot was located on which all trees 1.0 to 4.9 inches d. b. h. were sampled.

Means and ranges in age and tree dimensions measured are shown in table 1 for each species and species group sampled. Stump height averaged 0.2 feet for trees 1.0 to 4.9 inches d.b.h., 0.5 feet for trees 5.0 to 10.9 inches d. b. h., and 0.7 feet for trees > 11.0 inches d. b. h. Girard form class of the sawtimber-size trees (> 11.0 inches-d. b. h.) ranged from 66 to 86 and averaged 75 for the soft hardwoods, - and ranged from 65 to 91 and averaged 78 for the hard hardwoods.

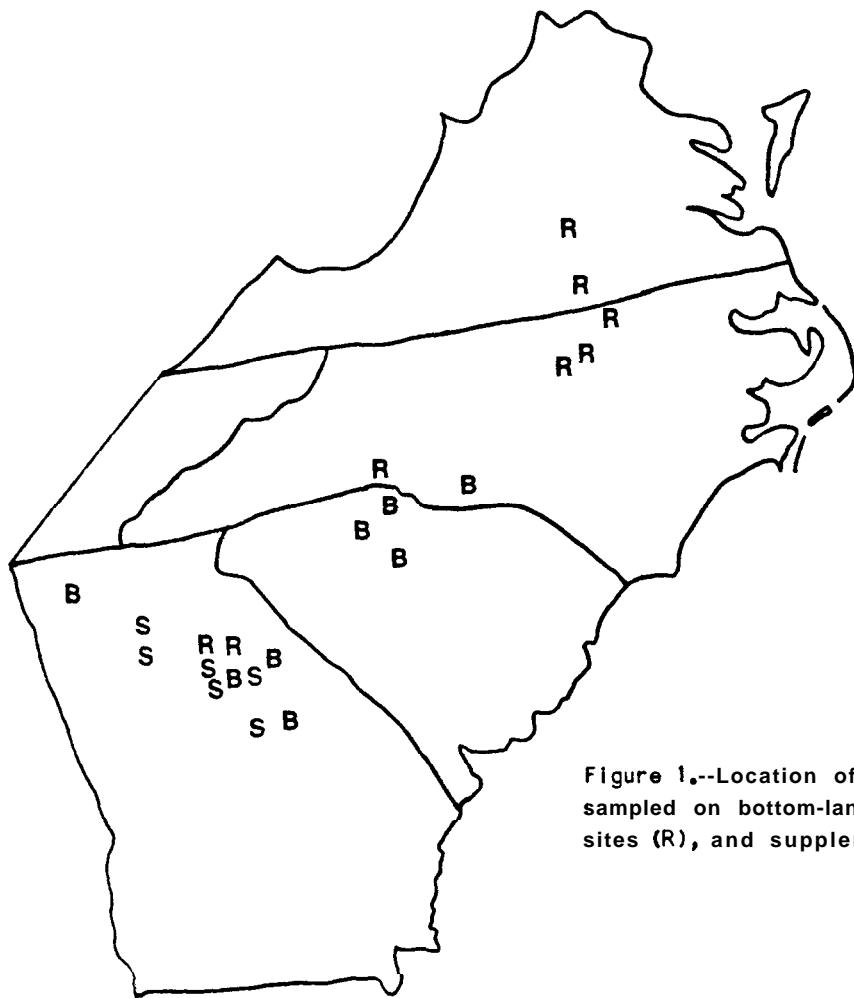


Figure 1.--Location of plots where trees were sampled on bottom-land sites (B), ridge and upland sites (R), and supplemental (S) locations.

**Each tree was felled and measured for d.o.b. at 4-foot intervals up the stem Total height, and height to the saw-log top, 9-, 4-, and Z-inch d.o.b., and base of full live crown were also recorded. Cross-sectional disks of wood and bark were removed from the stem and branches of sample trees for laboratory determination of specific gravity, moisture content, bark percentage, energy value, and nutrient concentration. In all trees > 5.0 inches d.b.h. except sawtimber-quality trees (trees > 11.0 inches d.b.h. with a minimum of one 16-foot grade 3 log), disks were cut at the butt, d.b.h., and quarter-points to the 4-inch d.o.b. top and at the Z-inch top. In sawtimber trees, disks were removed at the butt, at each saw-log bucking point, and at the stem location where d.o.b. measured 9, 4, and 2 inches. For trees less than 5.0 inches d.b.h., three disks per stem were taken--at stump height and at 25 and 75 percent of total stem height.**

**The branches of each tree were cut from the stem and weighed in four size categories: extra large (> 4.0 inches d.o.b.), large (2.0 to 3.9 inches d.o.b.), medium (0.6 to 1.9 inches d.o.b.), and small (< 0.5 inches d.o.b.). Three cross-sectional disks were cut from randomly selected branches in each size category for analysis in the laboratory. Sample branches were randomly selected and weighed with and without foliage to estimate foliage weight. A subsample of the foliage was taken to determine foliage moisture content.**

**The stem of each tree was weighed by components (saw logs, pulpwood, and topwood) and the branches of each tree were weighted by size category.**

## Laboratory

**Specific gravity was computed on green volume and oven dry weight.** Moisture content was computed on oven dry weight after samples were dried to a constant weight at 215 °F. Percentage of bark was determined from disks and based on the green weight of sample disks. Moisture content, specific gravity, and percentage of bark in stem branches, and total tree were calculated by weighting disk values in proportion to the volume of the component they represented. Weighted values for moisture content were used to convert component green weights to oven dry weight.

By using species diameter inside bark (d. i. b.) prediction equations developed from d. o. b. and d. i. b. stem disk measurements and the d. o. b. and height measurements taken at 4-foot intervals up the stem of each tree, the volume of wood in the stem to the saw log, g-inch, 4-inch, 3-inch, 2-inch, and tip were calculated using Smalian's formula. Green weight per cubic foot of stem bark and branch wood and bark were calculated from weighted values for specific gravity and moisture content with the equation:

$$\text{Green weight per cubic foot} = [1 + \frac{MC}{100}] . (SG) . (C) \quad (1)$$

where : **MC** = weighted moisture content in percent

**SG** = weighted specific gravity

**C** = 62.4 pounds (weight of water per cubic foot)

Cubic-foot volume of stem bark and branch wood and bark were computed by dividing green component weight by its green weight per cubic foot. Cubic-foot volume of stem wood and bark combined was computed by adding the volume of bark to the volume of wood.

## Analysis

Regression equations were developed to predict green and dry weight of wood, bark, and foliage and green volume of wood and bark in the total tree above stump, stem from butt to tip, and saw log stem. Independent variables were: diameter at breast height (D), total height (Th), saw log merchantable height (Mh), and height to a 4-inch d. o. b. top (H4).

A logarithmic transformation (base 10) was used to obtain a relatively homogeneous variance, which is assumed in regression analysis. Two equations were developed for the d. b. h., d. b. h. and total height, and d. b. h. and height to 4-inch top - one for trees < 11.0 inches d. b. h. and one for trees > 11.0 inches d. b. h. The 11-inch point was not the optimum point to shift from one equation to the other for all species or tree components, but it was the most desirable from a practical standpoint. Hardwood trees < 11 inches in diameter are classified as sapling or pole timber, and trees > 11 inches are classified as sawtimber. The procedure outlined in Draper and Smith (1981) for fitting two linear equations with a known point of intersection was used to develop the following equations:

$$\log Y_p = a + b \log X + E \quad (2)$$

$$\log Y_s = a + b \log (11^2 H) + c \log (D^2 / 11^2) + E \quad (3)$$

where: **Y<sub>p</sub>** = predicted component weight or volume for trees

< 11.0 inches d. b. h.

$\gamma_s$  = predicted component weight or volume for trees

$\geq 11.0$  inches d.b.h.

$X = D^2, D^2Th, \text{ or } D^2H^4$

$H = Th \text{ or } t-14$

$D = d. h. h.$

$E = \text{experimental error}$

$a, b, c = \text{regression coefficients}$

The following model was used for developing regression equations based on d.b.h. and saw-log merchantable height:

$$\log Y = a + b \log X_1 + c \log X_2 + E \quad (4)$$

where:  $Y = \text{predicted component weight or volume}$

$X_1 = D^2$

$X_2 = Th$

$E = \text{experimental error}$

$a, b, c = \text{regression coefficients}$

When logarithmic estimates are converted back to original units, they are biased downward because the antilogarithm of an estimated mean gives the geometric rather than the arithmetic mean (Cunia 1964). To adjust for this bias, a correction factor was computed and applied to each model by using Baskerville's (1972) procedure. The final equations, including correction factors, were:

$$Y = 10^{a + b \log(D^2) + c \log(Mh) + (S^2_{y,x} \times \log_e 10)/2} \quad (5)$$

$$Y_p = 10^{a + b \log(D^2H) + (S^2_{y,x} \log_e 10)/2} \quad (6)$$

$$Y_s = 10^{a + b \log(11^2H) + c \log(D^2/11^2) + (S^2_{y,x} \log_e 10)/2} \quad (7)$$

Equations (5), (6), and (7) can be simplified to:

$$Y = a' (D^2)^b (Mh)^c \quad (8)$$

$$Y_p = a' (D^2H)^b \quad (9)$$

$$Y_s = a'' (D^2)^b (H)^c \quad (10)$$

where:  $a' = 10^a + (S^2_{y,x} \log_e 10)/2$

$$a'' = a' (11^2)^b - c$$

$S^2_{y,x}$  = error mean square from regression analysis

**Comparison of average deviations (actual minus predicted) by d.b.h. classes and the sums of the squared deviations for the single log-log equation and segmented log-log equation showed that segmented log-log equations (9) and (10) gave the best results for the d.b.h., d.b.h. and total height, and d.b.h. and height to 4-inch top independent variable combinations (Clark and others 1984). Equations (9) and (10) are more complex than a single equation, but the improved accuracy justified their use.**

**The following exponential ratio equation was used to estimate the proportion of predicted total-stem weight or volume to a specified top d.o.b.:**

$$Y_R = e^a (d^b D^c) \quad (11)$$

**where:**  $Y_R$  = **ratio of stem weight or volume to top d.o.b. to**

**predicted total stem**

**d** = **specified stem top diameter in inches**

**D** = **tree diameter at breast height in inches**

**a,b,c** = **regression coefficients**

**e** = **base of natural log = 2.71828**

**The exponential ratio model shown below was developed to estimate a ratio for expanding saw-log stem weight or volume to any d.o.b. top above the saw-log top.**

$$Y_R = e^a \left[ (Mh)^b ((1 - (\frac{d}{.78D})^2)^2)^c \right] \quad (12)$$

**where:**  $Y_R$  = **ratio of stem weight or volume to top d.o.b. to**

**saw-log stem**

**Mh** = **saw-log merchantable height in feet**

**d** = **specified top diameter in inches**

**D** = **tree diameter at breast height in inches**

**.78** = **constant based on average form class**

**a,b,c** = **regression coefficients**

**e** = **2.71828 (base of natural log)**

## **Results**

### **Physical Properties of Sample Trees**

**The average specific gravity of wood and bark by tree component is shown in table 2 for individual species, soft hardwoods, hard hardwoods, and all trees combined. The average total-tree wood specific gravity of the soft hardwood species was 0.493 for saplings (1.0 to 4.9 inches d.b.h.), 0.467 for pole timber**

(5.0 to 10.9 inches d.b.h.), and 0.465 for sawtimber ( $> 11.0$  inches d.b.h.) compared with hard hardwood species, which averaged 0.623 for saplings, 0.608 for poletimber, and 0.618 for sawtimber. Yellow poplar had the lowest average total-tree wood specific gravity and red maple the highest for the soft hardwoods group. In the hard hardwoods group, elm had the lowest average total-tree wood specific gravity and white oak the highest.

Specific gravity of bark was lower than that of the wood for the soft hardwood species except red maple and sycamore, and for the hard hardwood species except scarlet oak and southern red oak (table 2).

The average moisture content of wood and bark by tree component and size class is shown in table 3 for the species and species groups sampled. Total-tree wood moisture content for the soft hardwoods averaged 97 percent for saplings, 102 percent for poletimber, and 105 percent for sawtimber compared with the hard hardwoods, which averaged 70 percent for saplings, 69 percent for poletimber, and 71 percent for sawtimber. In the soft hardwoods group, sycamore had the highest average total-tree wood moisture content compared with red maple, which had the lowest. In the hard hardwoods group, hickory had the lowest total-tree wood moisture content compared with scarlet oak, which had the highest.

Total-tree average bark moisture content for the soft hardwoods was 107 percent in saplings, 108 percent in poletimber, and 102 percent in sawtimber compared with 102 percent for saplings, 67 percent for poletimber, and 65 percent for sawtimber for the hard hardwood species (table 3).

Table 4 shows the average proportion of bark in the tree, based on green weight of wood and bark, by tree component and size class, for the species sampled. The percentage of stem weight in bark decreased as stem d.b.h. increased. Sycamore had a significantly lower proportion of its stem weight in bark than any of the other species. Yellow poplar had the highest bark percentage of the soft hardwoods and hickory and chestnut oak had the highest for the hard hardwoods.

The average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component, for saplings, poletimber, and sawtimber are shown in table 5. Because of the soft hardwood and hard hardwood species grouping, the average range of species green weight for cubic foot of wood for the two groups is similar--54 to 66 pounds for the soft hardwoods and 57 to 68 pounds for the hard hardwoods. This is caused by the relatively high moisture content of sweetgum and sycamore in the soft hardwoods group and the low moisture content of hickory in the hard hardwoods group. The average green weight per cubic foot of wood for the soft hardwood species was 60 pounds for poletimber and 61 pounds for sawtimber compared with 64 pounds for poletimber and 66 pounds for sawtimber hard hardwoods.

The average green weight of wood and bark per cubic foot of wood by tree component for saplings, poletimber, and sawtimber-size trees is shown in table 6. The weight of wood and bark per cubic-foot volume of wood is a useful factor for estimating the volume of wood in a tree or its components when weight of wood and bark is known or for estimating green weight of wood and bark when volume of wood is known. The green weight of wood and bark per cubic foot of wood for the total tree averaged 71 pounds for poletimber and 70 pounds for sawtimber soft hardwoods compared with 79 pounds for poletimber and sawtimber hard hardwoods.

The average green weight of wood and bark per cubic foot of wood was highest for branches and decreased with increasing stem diameter (table 6).

## Prediction Equations

A series of equations was developed to predict total-tree and tree component weight and volume for each species, the soft hardwood and hard hardwood groups, and all species combined. Equations were developed for predicting the green and dry weight of wood, bark and foliage, wood and bark combined, and wood alone in the above-stump total tree. Stem equations were developed for estimating the green and dry weight of wood and bark combined and wood alone for the total stem. Volume equations were also developed for wood and bark combined and wood alone in the above-stump total tree and total stem.

Since tree height is measured to different top limits by various organizations, equations were developed by using diameter ( $D$ ) alone and in combination with total height ( $Th$ ), height to 4-inch top ( $H4$ ), and merchantable height ( $Mh$ ) as independent variables. Equation (9) was used to estimate the weight and volume of the total tree and stem for trees 1.0 to 10.9 inches d.b.h., and equation (10) was used for trees  $> 11.0$  inches d.b.h. when  $D$  alone,  $D$  and  $Th$ , or  $D$  and  $H4$  were the independent variables.

Equation (8) was used to estimate weight and volume of the total tree and saw-log merchantable stem for trees  $> 11.0$  inches d.b.h. when  $D$  and  $Mh$  were the independent variables. Equations based on  $D$  and  $Mh$  were developed only for species sampled sufficiently in the sawtimber diameter classes. Equations were developed for the soft hardwoods, hard hardwoods, and all species, and for sweetgum, sycamore, yellow-poplar, scarlet oak, southern red oak, and white oak.

Equation (11) was used to estimate the proportion of total-stem weight or volume in the stem to any d.o.b. top when stem weight or volume was estimated with  $D$ ,  $D$  and  $Th$ , or  $D$  and  $H4$  as the independent variables. Equation (12) was used to estimate a ratio for expanding estimated saw-log merchantable-stem weight or volume to any d.o.b. top above the saw-log top when  $D$  and  $Mh$  were the independent variables.

Equations that use  $D$  with  $Th$  or  $D$  with  $H4$  fit the existing total-tree and total-stem weight and volume data well, based on the criteria of mean square error and absolute deviation of observed from predicted. Equations that use  $D$  and  $Mh$  fit existing saw-log merchantable-stem weight and volume data well. When average tree height and stem taper are similar to those of our sample trees, the equations with  $D$  alone will result in good estimates of the tree weight and volume. When average tree height by d.b.h. class is different from the sample trees, however, the equations that include a height variable should be applied directly or used to develop local weight-volume tables based on  $D$  alone.

Regression coefficients for estimating weight and volume are listed below, by independent variable and table number:

<u>Independent variable</u>	<u>Weight</u>	<u>Volume</u>
$D$ alone	tables 7, 8	tables 9, 10
$D$ and $Th$	tables 11, 12	tables 13, 14
$D$ and $H4$	tables 15, 16	tables 17, 18
$D$ and $Mh$	tables 19, 20	tables 21, 22

**In addition to the regression coefficients, tables 7 through 22 contain the coefficients of determination and standard error ( $\log_{10}$ ) for each equation.**

**Regression coefficients for estimating the proportion of the total-stem weight and volume in the stem to a specified d.o.b. top are given in tables 23 and 24. Table 23 contains coefficients for estimating ratios for stem green and dry weight of wood and bark combined and wood only, and table 24 contains the coefficients for stem volume of wood and bark combined and wood alone. Equation coefficients for expanding estimated saw-log merchantable-stem weight and volume are shown in tables 25 and 26, respectively.**

#### How to Use Prediction Equations

**The following examples illustrate how to use the equations in tables 7 through 26 to estimate the weight or volume of the total tree and its components.**

**This tabulation presents the tree data needed to estimate weight and volume when d.b.h. and Th are measured and equations (9) and (10) are used:**

**Example of trees < 11.0 inches d.b.h.**

$$D = 10.0 \text{ inches}$$

$$Th = 70 \text{ feet}$$

**Example of trees \geq 11.1) inches**

$$D = 14.0 \text{ inches}$$

$$Th = 90 \text{ feet}$$

**To estimate total-stem wood and bark green weight ( $Y_{STEMWB}$ ) of a soft hardwood with these dimensions, the following equations would be selected from table 12 and solved as follows:**

**Trees < 11.0 inches d.b.h.--use equation (9)**

$$\begin{aligned} Y_{STEMWB} &= a' (D^2 Th)^b \\ &= 0.19535 ((10^2)(70))^{0.95420} \\ &= 0.19535 (7000)^{0.95420} \\ &= \mathbf{0.19535} (4,666.51) \end{aligned}$$

$$Y_{STEMWB} = 912 \text{ pounds}$$

**Trees \geq 11 inches d.b.h.--use equation (10)**

$$\begin{aligned} Y_{STEMWB} &= a'' (D^2)^b (Th)^c \\ &= \mathbf{0.13963} (14^2)^{1.02422} (90)^{0.95420} \\ &= \mathbf{0.13963} (196)^{1.02422} (90)^{0.95420} \\ &= \mathbf{0.13963} (222.73) (73.24) \end{aligned}$$

$$Y_{STEMWB} = 2,278 \text{ pounds}$$

The same mathematical procedure shown above would be used to solve equations (9) or (10) for any of the tree component equations in tables 7 through 22.

To estimate the proportion of total stem green weight of wood and bark in the stem of a 10-inch d.b.h. tree to a 4-inch d.o.b. top ( $Y_R$ ), the following soft hardwood ratio regression coefficients would be selected from table 23 and solved by using equation (11) as shown below. The same equation is used for all size trees.

$$Y_R = e^a (d)^b (l)^c$$

$$\begin{aligned} &= 2.71823 \left[ \frac{-1}{-1} \right] -1.73265 (4)^4 \cdot 21073 (10) -4.28793 1 \\ &= 2.71828 \left[ \frac{-1}{-1} \right] -1.73265 (342.86) (0.0000515) 7 \\ &= 2.71828 -0.03059 \end{aligned}$$

$$Y_R = 0.970$$

$$\begin{aligned} \text{Stem weight to 4-inch top} &= (Y_{\text{STEMWB}}) (Y_R) \\ &= 912 (0.970) \end{aligned}$$

$$\text{Stem weight to 4-inch top} = 885 \text{ pounds}$$

The procedure shown above can be used to estimate the proportion of total stem in the stem to any d.o.b. top by substituting for  $d$  in equation (11).

The following tabulation shows the tree data needed to estimate weights and volumes when d.b.h. and  $lh$  are measured and equation (8) is used.

$$D = 14.0 \text{ inches d.b.h.}$$

$$lh = 2.0 \text{ logs}$$

To use equation (8),  $lh$  must be in feet, thus:

$$lh = 33.1 \text{ feet} = (2.0 \text{ logs}) (16.3 \text{ ft/log}) + (0.5 \text{ ft for stump})$$

To estimate the green weight of wood and bark in the saw-log merchantable stem ( $Y_{\text{SAWWB}}$ ) of a soft hardwood tree, by using equation (8) the following regression coefficients would be selected from table 20 and solved as follows:

$$\begin{aligned} Y_{\text{SAWWB}} &= a' (D^2)^b (lh)^c \\ &= 0.67595 (14^2)^{0.89328} (33.1)^{0.85866} \\ &= 0.67595 (111.59) (20.18) \end{aligned}$$

$$Y_{\text{SAWWB}} = 1,522 \text{ pounds}$$

The same mathematical procedure shown above would be used to solve equation (8) for any sawtimber tree component equation in tables 19 through 22.

To estimate a ratio ( $\gamma_R$ ) for expanding estimated saw-loy merchantable-stem green weight of wood and bark of the previous tree to weight to a 4-inch d.o.b. top, the following soft hardwood ratio equation would be selected from table 25 and solved by using equation (12) as shown below:

$$\gamma_R = e^a \left[ (Mh)^b ((1 - (\frac{d}{78D})^2)^2)^c \right]$$

$$= 2.71828^{34.56311} \left[ (33.1)^{-1.33687} ((1 - (\frac{4}{78(14)})^2)^2)^{0.34540} \right]$$

$$= 2.71828^{34.56311(0.009294)(0.90527)}$$

$$= 2.71828^{0.29080}$$

$$\gamma_R = 1.337$$

$$\text{Stem weight to 4-inch top} = (\gamma_{SAWWB})(\gamma_R)$$

$$= 1,522 (1.337)$$

$$\text{Stem weight to 4-inch top} = 2,035 \text{ pounds}$$

The tree components predicted by using the equations provided can be used to calculate additional tree components. For example, to estimate the weight or volume of the crown (branches and topwood) subtract estimated weight of the stem to a specified d.o.b. top from total-tree weight of wood and bark. The weight or volume of bark alone can also be estimated by subtracting component weight or volume of wood from wood and bark.

Similar-size trees may vary in weight and volume because of differences in crown size, stem taper, and weight per cubic foot. Therefore, these equations should be applied only to trees growing in natural, fully stocked stands with tree dimensions and weight per cubic foot similar to the tree sampled.

## Literature Cited

- Baskerville, G.L. Use of logarithmic regression in the estimation of plant biomass. *Canadian Journal of Forest Research* 2:49-53; 1972.
- Clark, Alexander, III; Muse, H. David; Phillips, Douglas R.; Frederick, Douglas J. Use of segmented log-log equations to estimate tree biomass. In: Saucier, Joseph R., ed. *Proceedings of the 1984 southern forest biomass workshop. Sixth annual meeting of the Southern Forest Biomass Working Group; 1984 June 5-7; Athens, GA. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1984: 51-57.*
- Clark, Alexander, III; Phillips, Douglas R.; Frederick, Douglas J. Biomass distribution and production of Coastal Plain hardwood stands. In: *Energy from biomass and wastes 7: proceedings of Institute of Gas Technology symposium 1983 January 24-28; Lake Buena Vista, FL; 1983: 101-115. [Available from Institute of Gas Technology, Chicago, IL]*
- Clark, Alexander, III; Phillips, Douglas R.; Frederick, Douglas J. Weight, volume, and physical properties of major hardwood species in the Gulf and Atlantic Coastal Plains. *Res. Pap. SE-250. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station; 1985. 66 pp.*
- Cunia, T. Weighted least squares method and construction of volume tables. *Forest Science* 10:180-191; 1954.
- Draper, N.R.; Smith, H. *Applied regression analyses. 2d ed. New York: John Wiley & Sons, Inc.; 1981. 709 pp.*
- Frederick, Douglas J.; Clark, Alexander, III; Phillips, Douglas R. Biomass, nutrient and energy relationships of Coastal Plain hardwoods. In: *The hardwood resource and its utilization: where are we going? 11th annual hardwood symposium of the Hardwood Research Council; 1983 May 10-13; High Hampton, NC; 1983:139-147. [Available from U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station, New Orleans, LA]*
- Gower, S.T.; Frederick, D.J.; Clark, A., III. Caloric content estimation and distribution in seven bottomland hardwood tree species growing in natural stands in the South. In: *Proceedings: fourth central hardwood forest conference; 1982 November 8-10; Lexington, KY: University of Kentucky; 1983: 384-390.*
- Messina, KG.; Gower, S.T.; Frederick, D.J.; Clark, A., III; Phillips, D.R. Biomass, nutrient, and energy content of southeastern wetland hardwood forests. *Hardwood Research Cooperative Series No. 2. Raleigh, NC: North Carolina State University; 1983: 28 pp.*

## TABLES

Table 1.--Mean and range of tree age and measurements, by species and tree size class

Tree size class (inches)	Sample trees	Age		D.b.h.		Total height		Height to 4- inch d.o.b. top		Height to saw- log merchantable top		D. o. b. at saw- log merchantable top		
		Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	
<b>Number</b>												<b>Feet</b>		
<b>SOFT HARDWOODS</b>														
1.0- 4.9	<b>108</b>	18	3-40	2.8	1.0- 4.9	33	12- 58	10	2-20	--	--	--	--	
5.0-10.9	<b>203</b>	36	12-72	7.4	5.0-10.9	61	40- 96	<b>34</b>	10-69	--	--	--	--	
>11.0	<b>124</b>	52	33-83	14.8	11.0-20.7	88	70- 115	<b>68</b>	47-90	39	8-67	10.0	8.0-14.5	
All trees	<b>435</b>	35	3-83	8.4	1.0-20.7	62	12- 115	<b>46</b>	2-90	39	8-67	10.0	8.0-14.5	
<b>RED MAPLE</b>														
1.0- 4.9	<b>8</b>	23	9-37	2.4	1.0- 4.9	33	15- 57	<b>20</b>	20-20	--	--	--	--	
5.0-10.9	<b>16</b>	42	22-72	7.3	5.2-10.7	61	45- 74	<b>36</b>	19-53	--	--	--	--	
>11.0	<b>8</b>	59	48-65	13.5	11.2-15.9	75	72- 80	<b>53</b>	48-56	18	17-22	11.1	9.2-14.3	
All trees	<b>32</b>	41	9-72	7.6	1.0-15.9	58	15- 80	<b>40</b>	19-56	18	17-22	11.1	9.2-14.3	
<b>SWEETGUM</b>														
1.0- 4.9	<b>61</b>	17	6-40	2.8	1.0- 4.9	34	13- 58	<b>7</b>	6- 8	--	--	--	--	
<b>5.0-10.9</b>	119	35	16-61	7.2	5.0-10.8	62	42- 96	<b>33</b>	10-69	--	--	--	--	
>11.0	56	49	33-83	14.6	11.1-20.7	89	71- 107	68	50-88	39	11-62	9.6	8.1-14.4	
All trees	236	34	6-83	7.8	1.0-20.7	61	13- 107	43	6-88	39	11-62	9.6	8.1-14.4	
<b>SYCAMORE</b>														
1.0- 4.9	<b>4</b>	10	3- 16	3.5	1.9- 4.9	44	30- 53	<b>13</b>	9-16	--	--	--	--	
<b>5.0-10.9</b>	<b>10</b>	19	12- 32	7.6	5.1- 9.4	58	48- 66	<b>36</b>	16-48	--	--	--	--	
>11.0	15	44	34- 59	15.0	11.0-19.5	97	71- 115	<b>76</b>	47-90	44	18-64	9.8	9.0-13.0	
All trees	29	31	3- 59	10.9	1.9-19.5	76	30- 115	<b>56</b>	9-90	44	18-64	9.8	9.0-13.0	
<b>YELLOW POPLAR</b>														
1.0- 4.0	<b>3</b>	32	31- 33	3.5	2.7- 4.6	41	33- 46	--	--	--	--	--	--	
5.0-10.9	<b>35</b>	41	15- 63	7.8	5.2-10.5	64	42- 85	<b>40</b>	17-63	--	--	--	--	
>11.0	40	61	35- 83	15.3	11.1-20.3	86	70- 107	<b>68</b>	54-89	42	17-67	10.0	8.0-14.5	
All trees	78	50	15- 83	11.5	2.7-20.3	74	33- 107	<b>55</b>	17-89	42	17-67	10.0	8.0-14.5	
<b>HARD HARDWOODS</b>														
1.0- 4.9	73	20	7- 39	2.3	1.0- 4.4	27	12- 53	<b>8</b>	6- 9	--	--	--	--	
5.0-10.9	165	44	12-105	7.3	5.0-10.9	59	29- 90	<b>34</b>	8-67	--	--	--	--	
>11.0	99	71	33-145	14.6	11.0-20.9	77	52- 97	<b>57</b>	34-79	31	14-52	11.6	8.3-18.5	
All Trees	338	45	7-145	8.4	1.0-20.9	57	12- 97	<b>42</b>	6-79	31	14-52	11.6	8.3-18.5	
<b>ELM</b>														
1.0- 4.0	<b>8</b>	22	13-30	2.0	1.0- 4.8	23	13- 52	<b>12</b>	12-12	--	--	--	--	
5.0-10.9	7	39	22-60	8.0	5.8-10.8	61	43- 77	<b>35</b>	12-54	--	--	--	--	
>11.0	1	42	42-42	11.2	11.2-11.2	71	71- 71	52	52-52	8	8- 8	10.4	10.4-10.4	
All trees	16	29	13-60	5.2	1.0-11.2	43	13- 77	34	12-54	8	8- 8	10.4	10.4-10.4	

Contnued

**Table 1.**--Mean and range of tree age and measurements, by species and tree size class--Continued

Tree size class (inches)	Sample trees	Age		D.b.h.		Total height		Height to 4- inch d.o.b. top		Height to saw- log merchantable top		D.o.b. at saw- log merchantable top		
		Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	
<u>Number</u>												<u>Inches</u>		
HICKORY												<u>Feet</u>		
1.0- 4.9	4	19	11- 25	2.2	1.5- 3.9	24	17- 36	--	--	--	--	--	--	
5.0-10.9	8	77	45-105	8.2	5.2-10.8	56	45- 68	36	15-50	--	--	--	--	
>11.0	10	125	90-145	14.8	11.5-18.5	80	68- 97	57	38-78	27	17-41	13.3	9.0-17.8	
All Trees	22	82	11-145	10.1	1.5-18.5	61	17- 97	47	15-78	27	17-41	13.3	9.0-17.8	
CHESTNUT OAK												<u>Inches</u>		
1.0- 4.9	12	16	7- 39	2.2	1.2- 4.1	30	12- 53	6	6- 6	--	--	--	--	
5.0-10.9	22	46	18- 65	6.7	5.0-10.8	56	29- 70	30	12-54	--	--	--	--	
>11.0	3	85	83- 90	13.8	12.9-14.6	62	59- 63	46	45-50	25	24-26	11.1	9.4-12.0	
All trees	37	41	7- 90	5.8	1.2-14.6	48	12- 70	31	6-54	25	24-26	11.1	9.4-12.0	
SCARLET OAK												<u>Inches</u>		
5.0-10.9	15	43	29- 56	7.8	5.1-10.9	59	48- 68	35	18-46	--	--	--	--	
>11.0	17	62	33- 86	14.2	11.2-18.8	66	53- 72	48	34-57	27	17-41	11.9	9.0-18.5	
All trees	32	50	29- 86	11.2	5.1-18.8	63	48- 72	42	18-57	27	17-41	11.9	9.0-18.5	
SOUTHERN RED OAK												<u>Inches</u>		
1.0- 4.9	2	16	12- 19	2.8	2.3- 3.2	36	30- 43	--	--	--	--	--	--	
5.0-10.9	22	22	15- 32	6.9	5.1-10.0	55	41- 81	30	8-58	--	--	--	--	
>11.0	24	63	38- 78	14.7	11.0-18.8	80	68- 88	61	49-70	33	14-46	12.0	9.0-18.0	
All trees	48	42	12- 78	10.6	2.3-18.8	67	30- 88	46	8-70	33	14-46	12.0	9.0-18.0	
WHITE OAK												<u>Inches</u>		
1.0- 4.9	15	28	20- 35	3.2	2.1- 4.4	34	15- 45	9	9- 9	--	--	--	--	
5.0-10.9	56	43	12- 66	7.5	5.1-10.5	58	47- 76	34	17-50	--	--	--	--	
>11.0	39	59	42- 80	15.1	11.2-20.9	77	52- 95	57	34-76	31	15-43	11.4	8.3-15.6	
All trees	110	44	12- 80	9.6	2.1-20.9	61	15- 95	43	9-76	31	15-43	11.4	8.3-15.6	
ALL SPECIES												<u>Inches</u>		
1.0- 4.9	181	19	3- 40	2.6	1.0- 4.9	31	12- 58	10	2-20	--	--	--	--	
5.0-10.9	368	39	12-105	7.4	5.0-10.9	60	29- 95	34	R-69	--	--	--	--	
>11.0	223	59	33-145	14.7	11.0-20.9	83	52-115	63	34-90	35	8-66	10.7	8.0-18.5	
All trees	772	39	3-145	8.4	1.0-20.9	60	12-115	44	2-90	35	8-66	10.7	8.0-18.5	

**Table 2 . . . Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 1-inch top	4-inch to tip	Butt to tip				
<b>SOFT HARWOODS</b>										
<b>Wood</b>										
1.0- 4.9	0.492 ± 0.060	--	--				0.492 ± 0.062	0.493 ± 0.060		
5.0-10.9	0.467 ± 0.053	--	--	0.466 ± 0.055	0.470 ± 0.055	0.465 ± 0.054	0.480 ± 0.048			
>11.0	0.465 ± 0.035	0.462 ± 0.039	0.473 ± 0.036	0.463 ± 0.037	0.478 ± 0.033	0.464 ± 0.036	0.475 ± 0.030			
<b>Bark</b>										
1.0- 4.9	0.394 ± 0.085	--	--	--			0.386 ± 0.096	0.427 ± 0.057		
5.0-10.9	0.407 ± 0.067	--	--	0.395 ± 0.083	0.427 ± 0.057	0.401 ± 0.076	0.424 ± 0.057			
>11.0	0.440 ± 0.073	0.440 ± 0.086	0.454 ± 0.078	0.445 ± 0.082	0.454 ± 0.065	0.445 ± 0.081	0.429 ± 0.068			
<b>Wood and Bark</b>										
1.0- 4.9	0.475 ± 0.054	--	--	--			0.473 ± 0.056	0.474 ± 0.053		
5.0-10.9	0.458 ± 0.048	--	--	0.453 ± 0.050	0.461 ± 0.047	0.457 ± 0.049	0.462 ± 0.046			
>11.0	0.461 ± 0.034	0.458 ± 0.039	0.467 ± 0.035	0.459 ± 0.036	0.471 ± 0.032	0.460 ± 0.036	0.459 ± 0.033			
<b>RED RAPLE</b>										
<b>Wood</b>										
1.0- 4.9	0.468 ± 0.032	--	--				0.473 ± 0.033	0.459 ± 0.035		
5.0-10.9	0.463 ± 0.019	--	--	0.462 ± 0.020	0.464 ± 0.026	0.462 ± 0.020	0.473 ± 0.028			
>11.0	0.524 ± 0.037	0.536 ± 0.035	0.514 ± 0.036	0.526 ± 0.036	0.526 ± 0.040	0.526 ± 0.036	0.519 ± 0.042			
<b>Bark</b>										
1.0- 4.9	0.467 ± 0.036	--	--	--			0.485 ± 0.029	0.434 ± 0.062		
5.0-10.9	0.499 ± 0.042	--	--	0.511 ± 0.046	0.490 ± 0.032	0.506 ± 0.044	0.478 ± 0.041			
>11.0	0.512 ± 0.039	0.547 ± 0.045	0.553 ± 0.041	0.551 ± 0.039	0.514 ± 0.045	0.550 ± 0.039	0.453 ± 0.050			
<b>Wood and Bark</b>										
1.0- 4.9	0.453 ± 0.027	--	--	--			0.475 ± 0.031	0.423 ± 0.046		
5.0-10.9	0.468 ± 0.017	--	--	0.466 ± 0.020	0.468 ± 0.024	0.467 ± 0.018	0.474 ± 0.020			
>11.0	0.523 ± 0.035	0.537 ± 0.033	0.518 ± 0.033	0.528 ± 0.034	0.524 ± 0.034	0.529 ± 0.033	0.502 ± 0.035			

*Continued*

**Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to Y-incn top	9-inch to 4-inch top	autt to 4-inch top	4-inch to tip	Butt to tip				
<b>SWEETGUM</b>										
<b>Wood</b>										
1.0- 4.9	<b>0.472 ± 0.027</b>	--	--	--	--	0.470 ± 0.029	0.479 ± 0.033			
5.0-10.9	<b>0.468 ± 0.028</b>	--	--	0.468 ± 0.032	0.468 ± 0.027	0.466 ± 0.030	0.481 ± 0.025			
>11.0	<b>0.479 ± 0.022</b>	0.476 ± 0.024	0.488 ± 0.026	0.477 ± 0.023	0.490 ± 0.022	0.478 ± 0.023	0.490 ± 0.017			
Bark										
1.0- 4.9	<b>0.338 ± 0.050</b>	--	--	--	--	0.325 ± 0.054	0.410 ± 0.051			
5.0-10.9	<b>0.378 ± 0.055</b>	--	--	0.353 ± 0.069	0.418 -- 0.054	0.366 ± 0.063	0.422 ± 0.035			
>11.0	<b>0.441 ± 0.053</b>	0.429 ± 0.071	0.451 ± 0.061	0.440 ± 0.064	0.462 ± 0.038	0.440 ± 0.063	0.440 ± 0.034			
Wood and Bark										
1.0- 4.9	<b>0.455 ± 0.021</b>	--	--	--	--	0.446 ± 0.026	0.457 ± 0.029			
5.0-10.9	<b>0.455 ± 0.027</b>	--	--	0.448 ± 0.031	0.458 ± 0.027	0.454 ± 0.029	0.463 ± 0.024			
>11.0	<b>0.475 ± 0.019</b>	0.471 ± 0.022	0.483 ± 0.025	0.473 ± 0.021	0.484 ± 0.020	0.474 ± 0.021	0.477 ± 0.017			
<b>SYCAMORE</b>										
<b>Wood</b>										
1.0- 4.9	<b>0.423 ± 0.036</b>	--	--	--	--	0.423 ± 0.037	0.440 ± 0.054			
5.0-10.9	<b>0.459 ± 0.020</b>	--	--	0.457 ± 0.020	0.459 ± 0.023	0.457 ± 0.020	0.468 ± 0.030			
>11.0	<b>0.447 ± 0.025</b>	0.450 ± 0.030	0.438 ± 0.017	0.446 ± 0.026	0.451 ± 0.030	0.447 ± 0.025	0.450 ± 0.027			
Bark										
1.0- 4.9	<b>0.466 ± 0.043</b>	--	--	--	--	0.467 ± 0.053	0.460 ± 0.043			
5.0-10.9	<b>0.504 ± 0.028</b>	--	--	0.517 ± 0.029	0.470 ± 0.044	0.510 ± 0.027	0.488 ± 0.043			
>11.0	<b>0.566 ± 0.034</b>	0.581 ± 0.036	0.575 ± 0.048	0.576 ± 0.039	0.558 ± 0.043	0.576 ± 0.039	0.545 ± 0.048			
Wood and Bark										
1.0- 4.9	<b>0.426 ± 0.036</b>	--	--	--	--	0.425 ± 0.037	0.445 ± 0.050			
5.0-10.9	<b>0.463 ± 0.019</b>	--	--	0.460 ± 0.019	0.460 ± 0.022	0.460 ± 0.019	0.471 ± 0.027			
>11.0	<b>0.454 ± 0.023</b>	0.454 ± 0.029	0.444 ± 0.017	0.451 ± 0.025	0.461 ± 0.028	0.452 ± 0.024	0.459 ± 0.026			
<b>YELLOW-POPLAR</b>										
<b>Wood</b>										
1.0- 4.9	<b>0.450 ± 0.033</b>	--	--	--	--	0.452 ± 0.038	0.431 ± 0.020			
5.0-10.9	0.406 ± 0.027	--	--	0.404 ± 0.031	0.417 ± 0.033	0.403 ± 0.030	0.426 ± 0.020			
>11.0	<b>0.444 ± 0.028</b>	0.439 ± 0.031	0.459 ± 0.036	0.442 ± 0.031	0.467 ± 0.030	0.442 ± 0.031	0.457 ± 0.019			

Continued

**Table Z--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches	
		Stem							
		Butt to 9-inch top	Y-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches		
<b>Bark</b>									
1.0- 4.9	<b>0.400 ± 0.014</b>	--	--				<b>0.402 ± 0.018</b>	<b>0.393 ± 0.002</b>	
5.0-10.9	<b>0.387 ± 0.023</b>	--	--	<b>0.395 ± 0.027</b>	<b>0.389 ± 0.029</b>	<b>0.394 ± 0.026</b>	<b>0.353 ± 0.033</b>		
>11.0	<b>0.381 ± 0.030</b>	<b>0.382 ± 0.035</b>	<b>0.398 ± 0.032</b>	<b>0.384 ± 0.034</b>	<b>0.394 ± 0.036</b>	<b>0.384 ± 0.034</b>	<b>0.364 ± 0.038</b>		
<b>Wood and Bark</b>									
1.0- 4.9	<b>0.440 ± 0.030</b>	--	--				<b>0.441 ± 0.028</b>	<b>0.420 ± 0.019</b>	
5.0-10.9	<b>0.403 ± 0.024</b>	--	--	<b>0.402 ± 0.028</b>	<b>0.411 ± 0.028</b>	<b>0.401 ± 0.026</b>	<b>0.403 ± 0.017</b>		
>11.0	<b>0.434 ± 0.026</b>	<b>0.430 ± 0.029</b>	<b>0.447 ± 0.031</b>	<b>0.433 ± 0.029</b>	<b>0.448 ± 0.026</b>	<b>0.434 ± 0.029</b>	<b>0.429 ± 0.024</b>		
<b>HARD HARDWOODS</b>									
<b>Wood</b>									
1.0- 4.9	<b>0.623 ± 0.036</b>	--	--	--	--		<b>0.625 ± 0.036</b>	<b>0.609 ± 0.049</b>	
5.0-10.9	<b>0.608 ± 0.045</b>	--	--	<b>0.606 ± 0.047</b>	<b>0.608 ± 0.047</b>	<b>0.605 ± 0.046</b>	<b>0.618 ± 0.049</b>		
>11.0	<b>0.618 ± 0.032</b>	<b>0.602 ± 0.039</b>	<b>0.627 ± 0.038</b>	<b>0.605 ± 0.038</b>	<b>0.654 ± 0.034</b>	<b>0.606 ± 0.038</b>	<b>0.654 ± 0.029</b>		
<b>Bark</b>									
1.0- 4.9	<b>0.432 ± 0.128</b>	--	--				<b>0.440 ± 0.145</b>	<b>0.399 ± 0.092</b>	
5.0-10.9	<b>0.555 ± 0.057</b>	--	--	<b>0.563 ± 0.069</b>	<b>0.556 ± 0.064</b>	<b>0.563 ± 0.068</b>	<b>0.530 ± 0.056</b>		
>11.0	<b>0.593 ± 0.057</b>	<b>0.608 ± 0.066</b>	<b>0.604 ± 0.067</b>	<b>0.607 ± 0.066</b>	<b>0.578 ± 0.060</b>	<b>0.606 ± 0.066</b>	<b>0.573 ± 0.061</b>		
<b>Wood and Bark</b>									
1.0- 4.9	<b>0.587 ± 0.032</b>	--	--	--	--		<b>0.592 ± 0.030</b>	<b>0.530 ± 0.065</b>	
5.0-10.9	<b>0.598 ± 0.037</b>	--	--	<b>0.598 ± 0.040</b>	<b>0.594 ± 0.038</b>	<b>0.599 ± 0.039</b>	<b>0.588 ± 0.041</b>		
>11.0	<b>0.616 ± 0.024</b>	<b>0.603 ± 0.031</b>	<b>0.623 ± 0.029</b>	<b>0.606 ± 0.029</b>	<b>0.633 ± 0.030</b>	<b>0.607 ± 0.030</b>	<b>0.631 ± 0.032</b>		
<b>ELM</b>									
<b>Wood</b>									
1.0- 4.9	<b>0.604 ± 0.050</b>	--	--				<b>0.606 ± 0.055</b>	<b>0.586 ± 0.047</b>	
5.0-10.9	<b>0.566 ± 0.034</b>	--	--	<b>0.570 ± 0.044</b>	<b>0.558 ± 0.035</b>	<b>0.566 ± 0.038</b>	<b>0.572 ± 0.028</b>		
<b>Bark</b>									
1.0- 4.9	<b>0.382 ± 0.041</b>	--	--				<b>0.351 ± 0.035</b>	<b>0.440 ± 0.049</b>	
5.0-10.9	<b>0.418 ± 0.042</b>	--	--	<b>0.405 ± 0.037</b>	<b>0.401 ± 0.044</b>	<b>0.404 ± 0.038</b>	<b>0.439 ± 0.063</b>		
<b>Wood and Bark</b>									
1.0- 4.9	<b>0.579 ± 0.047</b>	--	--	--			<b>0.560 ± 0.040</b>	<b>0.571 ± 0.021</b>	
5.0-10.9	<b>0.547 ± 0.030</b>	--	--	<b>0.551 ± 0.039</b>	<b>0.522 ± 0.030</b>	<b>0.550 ± 0.033</b>	<b>0.537 ± 0.034</b>		

*Continued*

**Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to Y-inch top	9-inch to 0-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<b>HICKORY</b>										
<b>Wood</b>										
1.0- 4.9	0.621 $\pm$ 0.011	--	--				0.631 $\pm$ 0.011	0.539 $\pm$ 0.042		
5.0-10.9	0.618 $\pm$ 0.037	--	--	<b>0.625 <math>\pm</math> 0.039</b>	0.624 $\pm$ 0.039	0.624 $\pm$ 0.038	0.591 $\pm$ 0.044			
$\geq$ 11.0	0.641 $\pm$ 0.036	0.632 $\pm$ 0.037	<b>0.668 <math>\pm</math> 0.036</b>	<b>0.638 <math>\pm</math> 0.036</b>	0.673 $\pm$ 0.040	0.639 $\pm$ 0.036	0.647 $\pm$ 0.043			
<b>Bark</b>										
1.0- 4.9	0.565 $\pm$ 0.038	--	--				0.571 $\pm$ 0.039	0.515 $\pm$ <b>0.083</b>		
5.0-10.9	0.502 $\pm$ 0.044	--	--	<b>0.530 <math>\pm</math> 0.029</b>	0.505 $\pm$ 0.050	0.530 $\pm$ 0.030	0.444 $\pm$ 3.049			
$\geq$ 11.0	0.530 $\pm$ 0.047	0.555 $\pm$ 0.050	<b>0.556 <math>\pm</math> 0.033</b>	<b>0.554 <math>\pm</math> 0.045</b>	0.514 $\pm$ 0.049	0.553 $\pm$ 0.044	0.488 $\pm$ 0.062			
<b>Wood and Bark</b>										
1.0- 4.9	0.592 $\pm$ 0.000	--	--				0.613 $\pm$ 0.018	0.467 $\pm$ 0.000		
5.0-10.9	0.591 $\pm$ 0.034	--	--	<b>0.603 <math>\pm</math> 0.033</b>	0.588 $\pm$ 0.033	0.602 $\pm$ 0.033	0.532 $\pm$ 0.039			
$\geq$ 11.0	0.621 $\pm$ 0.034	0.620 $\pm$ 0.037	<b>0.645 <math>\pm</math> 0.033</b>	<b>0.624 <math>\pm</math> 0.036</b>	0.631 $\pm$ 0.036	0.625 $\pm$ 0.036	0.596 $\pm$ 0.046			
<b>CHESTNUT OAK</b>										
<b>Wood</b>										
1.0- 4.9	0.617 $\pm$ 0.032	--	--				0.623 $\pm$ 0.030	0.579 $\pm$ 0.053		
5.0-10.9	<b>0.618 <math>\pm</math> 0.023</b>	--	--	<b>0.623 <math>\pm</math> 0.020</b>	<b>0.609 <math>\pm</math> 0.037</b>	0.620 $\pm$ 0.023	0.602 $\pm$ 0.035			
$\geq$ 11.0	0.615 $\pm$ 0.026	0.608 $\pm$ 0.036	<b>0.626 <math>\pm</math> 0.033</b>	<b>0.616 <math>\pm</math> 0.035</b>	0.618 $\pm$ 0.029	0.616 $\pm$ 0.034	0.595 $\pm$ 0.041			
<b>Bark</b>										
1.0- 4.9	0.506 $\pm$ <b>0.036</b>	--	--				0.509 $\pm$ 0.042	0.484 $\pm$ 0.020		
5.0-10.9	0.549 $\pm$ <b>0.023</b>	--	--	<b>0.567 <math>\pm</math> 0.026</b>	0.538 $\pm$ 0.032	0.563 $\pm$ 0.024	0.477 $\pm$ 0.034			
$\geq$ 11.0	0.550 $\pm$ 0.022	0.581 $\pm$ 0.009	<b>0.564 <math>\pm</math> 0.013</b>	<b>0.573 <math>\pm</math> 0.004</b>	0.526 $\pm$ 0.024	0.572 $\pm$ 0.004	0.504 $\pm$ 0.040			
<b>Wood and Bark</b>										
1.0- 4.9	0.591 $\pm$ 0.029	--	--				0.595 $\pm$ 0.028	0.544 $\pm$ 0.039		
5.0-10.9	0.603 $\pm$ 0.020	--	--	<b>0.611 <math>\pm</math> 0.017</b>	0.590 $\pm$ 0.031	0.609 $\pm$ 0.021	0.553 $\pm$ 0.035			
$\geq$ 11.0	0.601 $\pm$ 0.018	0.602 $\pm$ 0.031	<b>0.612 <math>\pm</math> 0.022</b>	<b>0.607 <math>\pm</math> 0.027</b>	0.591 $\pm$ 0.019	0.608 $\pm$ 0.027	0.566 $\pm$ 0.033			

Continued

**Table 2---Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to 9-inch top	Y-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
SCARLET OAK										
Wood										
5.0-10.9	0.602 ± 0.018	--	--	0.590 ± 0.021	0.612 ± 0.021	0.591 ± 0.020	0.645 ± 0.008			
>11.0	0.592 ± 0.030	0.569 ± 0.040	0.599 ± 0.036	0.573 ± 0.038	0.636 ± 0.033	0.573 ± 0.038	0.641 ± 0.015			
Bark										
5.0-10.9	0.602 ± 0.030	--	--	0.620 ± 0.035	0.584 ± 0.043	0.615 ± 0.037	0.569 ± 0.010			
>11.0	0.621 ± 0.018	0.649 ± 0.029	0.647 ± 0.030	0.648 ± 0.029	0.615 ± 0.021	0.647 ± 0.029	0.587 ± 0.015			
Wood and Bark										
5.0-10.9	0.602 ± 0.014	--	--	<b>0.594 ± 0.019</b>	0.606 ± 0.017	0.594 ± 0.017	0.622 ± 0.009			
>11.0	0.597 ± 0.025	0.579 ± 0.036	<b>0.606 ± 0.032</b>	<b>0.582 ± 0.035</b>	0.631 ± 0.026	0.583 ± 0.035	0.628 ± 0.010			
SOUTHERN RED OAK										
Wood										
1.0- 4.9	0.634 ± 0.021	--	--	--	--	0.633 ± 0.018	0.637 ± 0.033			
5.0-10.9	0.606 ± 0.036	--	--	0.604 ± 0.041	0.614 ± 0.026	0.601 ± 0.039	0.648 ± 0.018			
>11.0	0.596 ± 0.020	0.572 ± 0.023	0.604 ± 0.024	0.576 ± 0.021	0.653 ± 0.032	0.577 ± 0.021	0.651 ± 0.028			
Bark										
1.0- 4.9	0.605 ± 0.088	--	--	--	--	0.626 ± 0.112	0.520 ± 0.001			
5.0-10.9	0.621 ± 0.052	--	--	0.632 ± 0.063	0.636 ± 0.051	<b>0.638 ± 0.059</b>	0.574 ± 0.048			
>11.0	0.665 ± 0.034	0.680 ± 0.046	0.675 ± 0.045	0.681 ± 0.044	0.639 ± 0.042	0.680 ± 0.044	0.636 ± 0.027			
Wood and Bark										
1.0- 4.9	0.625 ± 0.038	--	--	--	--	0.627 ± 0.041	0.599 ± 0.023			
5.0-10.9	0.609 ± 0.030	--	--	0.608 ± 0.035	0.619 ± 0.026	0.608 ± 0.034	0.624 ± 0.019			
>11.0	0.610 ± 0.018	0.588 ± 0.019	0.618 ± 0.022	0.593 ± 0.017	0.649 ± 0.032	0.593 ± 0.017	0.647 ± 0.023			
WHITE OAK										
Wood										
1.0- 4.9	0.627 ± 0.024	--	--	--	--	0.628 ± 0.024	0.607 ± 0.043			
5.0-10.9	0.636 ± 0.029	--	--	<b>0.635 ± 0.031</b>	0.635 ± 0.032	0.634 ± 0.030	0.639 ± 0.038			
>11.0	0.636 ± 0.021	0.621 ± 0.027	<b>0.643 ± 0.030</b>	<b>0.623 ± 0.027</b>	0.664 ± 0.029	0.624 ± 0.027	0.671 ± 0.015			

Continued

Table 2.--Average specific gravity of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued

Tree size class r... --	Total tree	Butt to 4-inch top		9-inch to 4-inch top		Butt to 4-inch top		4-inch to tip		butt to tip		Branches
		Bark	Wood and Bark	Bark	Wood and Bark	Bark	Wood and Bark	Bark	Wood and Bark	Bark	Wood and Bark	
1.0- 4.9	0.464 ± 0.038	--	--	0.511 ± 0.045	0.522 ± 0.037	0.463 ± 0.038	0.489 ± 0.052	0.511 ± 0.042	0.538 ± 0.052	0.566 ± 0.050	0.572 ± 0.045	
5.0-10.9	0.520 ± 0.035	--	--	0.570 ± 0.049	0.572 ± 0.045	0.557 ± 0.038	0.572 ± 0.045	0.572 ± 0.045	0.572 ± 0.045	0.566 ± 0.050	0.566 ± 0.050	
>11.0	0.568 ± 0.028	0.574 ± 0.045	0.574 ± 0.045	0.570 ± 0.049	0.572 ± 0.045	0.557 ± 0.038	0.572 ± 0.045	0.572 ± 0.045	0.572 ± 0.045	0.566 ± 0.050	0.566 ± 0.050	
1.0- 4.9	0.617 ± 0.025	--	--	0.615 ± 0.029	0.607 ± 0.025	0.595 ± 0.027	0.607 ± 0.017	0.617 ± 0.028	0.607 ± 0.027	0.642 ± 0.023	0.642 ± 0.023	
5.0-10.9	0.627 ± 0.018	0.616 ± 0.024	0.616 ± 0.024	0.632 ± 0.026	0.617 ± 0.023	0.633 ± 0.025	0.619 ± 0.023	0.619 ± 0.023	0.619 ± 0.023	0.642 ± 0.023	0.642 ± 0.023	
>11.0												
ALL SPECIES												
1.0- 4.9	0.534 ± 0.081	--	--	0.524 ± 0.086	0.527 ± 0.086	0.534 ± 0.083	0.530 ± 0.079	0.523 ± 0.086	0.537 ± 0.084	0.553 ± 0.094	0.553 ± 0.094	
5.0-10.9	0.525 ± 0.085	--	--	0.526 ± 0.080	0.526 ± 0.080	0.556 ± 0.093	0.526 ± 0.080	0.526 ± 0.080	0.526 ± 0.080	0.553 ± 0.094	0.553 ± 0.094	
>11.0	0.532 ± 0.083	0.524 ± 0.080	0.541 ± 0.085	0.541 ± 0.085	0.541 ± 0.085	0.556 ± 0.093	0.556 ± 0.093	0.556 ± 0.093	0.556 ± 0.093	0.556 ± 0.093	0.556 ± 0.093	
1.0- 4.9	0.406 ± 0.102	--	--	0.464 ± 0.114	0.480 ± 0.087	0.403 ± 0.116	0.418 ± 0.071	0.468 ± 0.108	0.468 ± 0.077	0.492 ± 0.097	0.492 ± 0.097	
5.0-10.9	0.468 ± 0.097	--	--	0.520 ± 0.104	0.516 ± 0.110	0.508 ± 0.088	0.516 ± 0.110	0.516 ± 0.110	0.516 ± 0.110	0.553 ± 0.094	0.553 ± 0.094	
>11.0	0.508 ± 0.101	0.514 ± 0.114	0.514 ± 0.114	0.520 ± 0.104	0.516 ± 0.110	0.508 ± 0.088	0.508 ± 0.088	0.508 ± 0.088	0.508 ± 0.088	0.553 ± 0.094	0.553 ± 0.094	
1.0- 4.9	0.507 ± 0.071	--	--	0.513 ± 0.085	0.516 ± 0.079	0.511 ± 0.074	0.490 ± 0.062	0.515 ± 0.083	0.514 ± 0.076	0.525 ± 0.080	0.525 ± 0.080	
5.0-10.9	0.515 ± 0.082	--	--	0.536 ± 0.084	0.524 ± 0.080	0.542 ± 0.086	0.542 ± 0.086	0.542 ± 0.086	0.542 ± 0.086	0.553 ± 0.091	0.553 ± 0.091	
>11.0	0.529 ± 0.083	0.522 ± 0.080	0.522 ± 0.080	0.536 ± 0.084	0.536 ± 0.084	0.542 ± 0.080	0.542 ± 0.080	0.542 ± 0.080	0.542 ± 0.080	0.553 ± 0.091	0.553 ± 0.091	

Table 3--Average **moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to Y-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
- - - - - Percent - - - - -										
<b>SOFT HARDWOODS</b>										
<b>Wood</b>										
1.0- 4.9	97 ± 22.4	--	--	--	--	98 ± 23.3	96 ± 20.8			
5.0-10.9	102 ± 22.4	--	--	<b>103 ± 24.0</b>	99 ± 22.3	103 ± 23.8	101 ± 18.1			
>11.0	105 ± 18.4	107 ± 22.0	<b>100 ± 19.7</b>	<b>106 ± 20.8</b>	98 ± 14.7	106 ± 20.6	101 ± 11.2			
<b>Bark</b>										
1.0- 4.9	107 ± 23.8	--	--	--	--	<b>106 ± 25.5</b>	<b>118 ± 29.1</b>			
5.0-10.9	108 ± 24.5	--	--	<b>103 ± 28.0</b>	117 ± 28.9	<b>105 ± 27.4</b>	<b>127 ± 30.2</b>			
>11.0	102 ± 22.5	95 ± 27.3	<b>97 ± 28.4</b>	<b>94 ± 26.1</b>	118 ± 30.3	<b>95 ± 26.0</b>	<b>124 ± 27.6</b>			
<b>Wood and Bark</b>										
1.0- 4.9	102 ± 19.4	--	--	--	--	99 ± 22.1	105 ± 20.4			
5.0-10.9	103 ± 20.4	--	--	<b>102 ± 21.5</b>	102 ± 20.0	103 ± 21.4	109 ± 20.1			
>11.0	104 ± 15.5	106 ± 19.1	<b>99 ± 16.8</b>	<b>104 ± 17.9</b>	102 ± 14.3	105 ± 17.8	108 ± 14.1			
<b>RED MAPLE</b>										
<b>Wood</b>										
1.0- 4.9	77 ± 1.9	--	--	--	--	77 ± 7.5	<b>79 ± 9.9</b>			
5.0-10.9	77 ± 14.1	--	--	76 ± 15.8	81 ± 13.4	76 ± 15.5	85 ± 10.4			
>11.0	66 ± 5.9	63 ± 6.1	63 ± 4.6	63 ± 5.4	70 ± 5.7	63 ± 5.3	76 ± 8.2			
<b>Bark</b>										
1.0- 4.9	97 ± 7.8	--	--	--	--	95 ± 9.6	99 ± 16.9			
5.0-10.9	94 ± 13.2	--	--	91 ± 14.2	101 ± 10.0	93 ± 13.4	94 ± 20.9			
>11.0	102 ± 9.3	93 ± 19.3	95 ± 7.3	92 ± 11.3	108 ± 15.7	93 ± 11.4	117 ± 12.8			
<b>Wood and Bark</b>										
1.0- 4.9	86 ± 2.1	--	--	--	--	80 ± 6.7	89 ± 7.0			
5.0-10.9	79 ± 13.1	--	--	<b>77 ± 14.2</b>	83 ± 11.7	78 ± 14.0	87 ± 11.8			
>11.0	70 ± 5.1	65 ± 5.1	<b>67 ± 4.4</b>	<b>66 ± 4.8</b>	76 ± 6.5	67 ± 4.7	86 ± 6.5			
<b>SWEETGUM</b>										
<b>Wood</b>										
1.0- 4.9	112 ± 10.0	--	--	--	--	113 ± 11.1	106 ± 17.4			
5.0-10.9	113 ± 11.7	--	--	<b>114 ± 13.0</b>	108 ± 14.6	113 ± 12.8	106 ± 10.2			
>11.0	111 ± 10.9	115 ± 13.1	<b>104 ± 12.9</b>	<b>113 ± 12.1</b>	97 ± 9.2	112 ± 12.0	101 ± 9.1			
<b>Bark</b>										
1.0- 4.9	117 ± 23.3	--	--	--	--	116 ± 25.1	132 ± 27.2			
5.0-10.9	108 ± 22.3	--	--	<b>102 ± 27.7</b>	115 ± 22.5	104 ± 26.7	128 ± 15.5			
>11.0	92 ± 19.6	86 ± 26.6	<b>85 ± 24.5</b>	<b>83 ± 23.0</b>	106 ± 22.9	84 ± 22.9	116 ± 16.0			

*Continued*

**Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Stem								
		Butt to 9-inch top	Y-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<b>Percent</b>										
<b>Wood and Bark</b>										
1.0- 4.9	<b>86 ± 2.7</b>	--	--	--			<b>80 ± 6.7</b>	<b>89 ± 7.0</b>		
5.0-10.9	<b>79 ± 13.1</b>	--		<b>77 ± 14.2</b>	83 ± 11.7		<b>78 ± 14.0</b>	<b>87 ± 11.8</b>		
>11.0	<b>70 ± 5.7</b>	65 ± 5.1	<b>67 ± 4.4</b>	<b>66 ± 4.8</b>	76 ± 6.5	67 ± 4.7	86 ± 6.5			
<b>SWEETGUM</b>										
<b>Wood</b>										
1.0- 4.9	<b>112 ± 10.0</b>	--	--	<b>114 ± 13.0</b>	108 ± 14.6		<b>113 ± 11.1</b>	<b>106 ± 17.4</b>		
5.0-10.9	<b>113 ± 11.7</b>	--		<b>113 ± 12.1</b>	112 ± 12.11		<b>113 ± 12.8</b>	<b>106 ± 10.2</b>		
>11.0	<b>111 ± 10.9</b>	115 ± 13.1	<b>104 ± 12.9</b>		97 ± 9.2	112 ± 12.11	101 ± 9.1			
<b>Bark</b>										
1.0- 4.9	<b>117 ± 23.3</b>	--	--	<b>102 ± 27.7</b>	115 ± 22.5		<b>116 ± 25.1</b>	<b>132 ± 27.2</b>		
5.0-10.9	<b>108 ± 22.3</b>	--		<b>85 ± 24.5</b>	<b>83 ± 23.0</b>	106 ± 22.9	<b>104 ± 26.7</b>	<b>128 ± 15.5</b>		
>11.0	<b>92 ± 19.6</b>	86 ± 26.6				84 ± 22.9	116 ± 16.0			
<b>Wood and Bark</b>										
1.0- 4.9	<b>112 ± 8.8</b>	--	--	<b>111 ± 11.8</b>			<b>114 ± 11.1</b>	<b>112 ± 19.1</b>		
5.0-10.9	<b>111 ± 10.7</b>	--		<b>109 ± 9.7</b>	109 ± 13.0		<b>112 ± 11.9</b>	<b>113 ± 8.6</b>		
>11.0	<b>108 ± 8.6</b>	112 ± 10.9	100 ± 10.0		98 ± 9.4	110 ± 10.0	105 ± 9.3			
<b>SYCAMORE</b>										
<b>Wood</b>										
1.0- 4.9	<b>121 ± 20.7</b>	--	--				<b>121 ± 21.3</b>	<b>118 ± 14.9</b>		
5.0-10.9	<b>123 ± 13.7</b>	--	--	125 ± 14.5	121 ± 19.5		<b>124 ± 14.9</b>	<b>116 ± 14.4</b>		
>11.0	<b>122 ± 7.6</b>	125 ± 11.6	127 ± 8.7	126 ± 9.7	119 ± 7.5	125 ± 9.2	106 ± 6.3			
<b>Bark</b>										
1.0- 4.9	<b>116 ± 32.9</b>	--	--				<b>116 ± 39.4</b>	<b>121 ± 30.7</b>		
5.0-10.9	<b>120 ± 15.8</b>	--		116 ± 20.2	145 ± 30.6		<b>120 ± 19.4</b>	<b>122 ± 13.2</b>		
>11.0	<b>92 ± 6.7</b>	90 ± 9.7	93 ± 10.7	91 ± 9.9	96 ± 23.4	91 ± 9.7	94 ± 9.1			
<b>Wood and Bark</b>										
1.0- 4.9	<b>121 ± 21.4</b>	--	--				<b>121 ± 22.2</b>	<b>118 ± 12.0</b>		
5.0-10.9	<b>122 ± 13.3</b>	--		124 ± 14.4	123 ± 18.9		<b>124 ± 14.7</b>	<b>117 ± 12.2</b>		
>11.0	<b>120 ± 7.0</b>	124 ± 11.3	126 ± 8.4	124 ± 9.4	117 ± 7.0	124 ± 8.9	<b>104 ± 5.9</b>			
<b>YELLOW-POPLAR</b>										
<b>Wood</b>										
1.0- 4.9	<b>101 ± 18.9</b>	--	--				<b>101 ± 19.6</b>	<b>97 ± 5.7</b>		
5.0-10.9	<b>99 ± 21.3</b>	--		99 ± 23.9	Y3 ± 20.4		<b>98 ± 23.4</b>	<b>109 ± 10.5</b>		
>11.0	<b>97 ± 17.0</b>	96 ± 19.4	91 ± 15.7	96 ± 19.0	97 ± 13.5	96 ± 18.9	106 ± 7.9			

**Continued**

**Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<b>percent</b>										
<b>Bark</b>										
1.0- 4.9	102 ± 35.6	--	--	--	--	98 ± 38.9	115 ± 33.2			
5.0-10.9	67 ± 12.3	--	--	64 ± 14.5	70 ± 13.8	64 ± 13.9	78 ± 14.2			
>11.0	65 ± 12.9	61 ± 15.5	62 ± 15.0	61 ± 15.4	68 ± 15.3	61 ± 15.3	71 ± 13.9			
<b>Wood and Bark</b>										
1.0- 4.9	77 ± 13.9	--	--	--	--	75 ± 12.9	85 ± 13.8			
5.0-10.9	68 ± 7.1	--	--	69 ± 8.4	69 ± 7.8	69 ± 8.2	70 ± 7.5			
>11.0	69 ± 6.3	73 ± 8.6	67 ± 7.2	72 ± 8.3	64 ± 6.4	72 ± 8.2	63 ± 5.8			
<b>ELM</b>										
<b>Wood</b>										
1.0- 4.9	66 ± 5.9	--	--	--	--	66 ± 7.8	67 ± 4.6			
5.0-10.9	76 ± 6.9	--	--	--	78 ± 8.6	75 ± 5.6	78 ± 7.7	70 ± 7.5		
<b>Bark</b>										
1.0- 4.9	93 ± 10.0	--	--	--	--	94 ± 12.5	92 ± 16.5			
5.0-10.9	87 ± 15.0	--	--	--	91 ± 24.5	89 ± 20.5	90 ± 21.9	82 ± 10.7		
<b>Wood and Bark</b>										
1.0- 4.9	71 ± 4.5	--	--	--	--	71 ± 6.0	72 ± 5.7			
5.0-10.9	77 ± 6.8	--	--	--	79 ± 8.2	78 ± 6.6	79 ± 7.1	73 ± 8.3		
<b>HICKORY</b>										
<b>Wood</b>										
1.0- 4.9	61 ± 5.5	--	--	--	--	60 ± 5.9	65 ± 5.3			
5.0-10.9	56 ± 6.8	--	--	54 ± 5.6	54 ± 5.4	54 ± 5.4	63 ± 9.4			
>11.0	58 ± 7.8	63 ± 8.7	52 ± 4.0	61 ± 8.1	51 ± 4.1	61 ± 8.1	52 ± 8.5			
<b>Bark</b>										
1.0- 4.9	75 ± 14.5	--	--	--	--	75 ± 14.6	78 ± 16.6			
5.0-10.9	85 ± 17.2	--	--	78 ± 15.2	88 ± 20.0	78 ± 14.7	99 ± 15.2			
>11.0	81 ± 15.4	76 ± 16.1	75 ± 12.8	76 ± 14.9	88 ± 21.2	76 ± 14.7	89 ± 20.7			
<b>Wood and Bark</b>										
1.0- 4.9	74 ± 0.0	--	--	--	--	64 ± 8.4	79 ± 0.0			
5.0-10.9	63 ± 8.8	--	--	59 ± 6.4	64 ± 8.9	59 ± 6.3	77 ± 12.0			
>11.0	62 ± 7.9	65 ± 9.5	57 ± 5.3	64 ± 8.8	60 ± 6.5	63 ± 8.7	64 ± 11.4			

**Continued**

**Table 3.--Average moisture content of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species In the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation							Branches		
		Stem									
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-Inch top	4-inch to tip	Butt to tip					
<u>Percent</u>											
<b>CHESTNUT OAK</b>											
<b>Wood</b>											
1.0- 4.9	<b>63 ± 5.3</b>	--	--								
5.0-10.9	<b>63 ± 4.6</b>	--	--								
>11.0	<b>69 ± 3.6</b>	<b>72 ± 4.0</b>	<b>68 ± 2.4</b>	<b>70 ± 3.5</b>	<b>63 ± 5.3</b>	<b>62 ± 5.7</b>	<b>69 ± 5.2</b>	<b>63 ± 3.2</b>	<b>66 ± 4.9</b>		
<b>Bark</b>											
1.0- 4.9	<b>80 ± 16.8</b>	--	--								
5.0-10.9	<b>57 ± 6.9</b>	--	--								
>11.0	<b>62 ± 8.9</b>	<b>53 ± 5.9</b>	<b>56 ± 11.6</b>	<b>54 ± 8.7</b>	<b>63 ± 10.8</b>	<b>51 ± 5.3</b>	<b>90 ± 10.8</b>	<b>55 ± 8.6</b>	<b>78 ± 7.0</b>		
<b>Wood and Bark</b>											
1.0- 4.9	<b>67 ± 8.1</b>	--	--								
5.0-10.9	<b>61 ± 3.4</b>	--	--								
>11.0	<b>67 ± 0.8</b>	<b>68 ± 1.8</b>	<b>64 ± 1.3</b>	<b>67 ± 0.5</b>	<b>62 ± 5.3</b>	<b>65 ± 8.7</b>	<b>81 ± 5.6</b>	<b>73 ± 5.2</b>	<b>70 ± 4.8</b>		
<b>SCARLET OAK</b>											
<b>Wood</b>											
5.0-10.9	<b>74 ± 3.5</b>	--	--								
>11.0	<b>79 ± 6.8</b>	<b>85 ± 9.0</b>	<b>77 ± 7.8</b>	<b>85 ± 8.5</b>	<b>70 ± 2.6</b>	<b>77 ± 5.4</b>	<b>62 ± 0.8</b>	<b>65 ± 3.2</b>	<b>62 ± 0.8</b>		
<b>Bark</b>											
5.0-10.9	<b>65 ± 5.1</b>	--	--								
>11.0	<b>63 ± 5.6</b>	<b>62 ± 8.1</b>	<b>62 ± 7.0</b>	<b>62 ± 1.6</b>	<b>67 ± 8.8</b>	<b>67 ± 8.5</b>	<b>64 ± 2.3</b>	<b>64 ± 5.3</b>	<b>64 ± 5.3</b>		
<b>Wood and Bark</b>											
5.0-10.9	<b>72 ± 3.4</b>	--	--								
>11.0	<b>76 ± 5.9</b>	<b>82 ± 8.1</b>	<b>75 ± 6.7</b>	<b>82 ± 7.6</b>	<b>76 ± 5.6</b>	<b>70 ± 2.6</b>	<b>76 ± 5.4</b>	<b>63 ± 1.4</b>	<b>65 ± 2.9</b>		
<b>SOUTHERN RED OAK</b>											
<b>Wood</b>											
1.0- 4.9	<b>68 ± 5.7</b>	--	--								
5.0-10.9	<b>71 ± 4.6</b>	--	--								
>11.0	<b>74 ± 4.4</b>	<b>81 ± 6.1</b>	<b>73 ± 3.3</b>	<b>80 ± 5.3</b>	<b>72 ± 6.4</b>	<b>69 ± 5.3</b>	<b>64 ± 7.8</b>	<b>62 ± 5.0</b>	<b>60 ± 5.7</b>		
<b>Bark</b>											
1.0- 4.9	<b>70 ± 23.1</b>	--	--								
5.0-10.9	<b>61 ± 11.9</b>	--	--								
>11.0	<b>53 ± 8.4</b>	<b>50 ± 12.9</b>	<b>49 ± 7.0</b>	<b>50 ± 11.6</b>	<b>58 ± 12.5</b>	<b>61 ± 10.3</b>	<b>69 ± 26.4</b>	<b>73 ± 7.6</b>	<b>72 ± 12.3</b>		
<b>Continued</b>											

**Table 3. --Average moisture content of wood, bark, and wood and bark combined, by tree component and site class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation stem						Branches		
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<u>Percent</u>										
<b>Wood and Bark</b>										
1.O- 4.9	69 ± 11.0	--	--				69 ± 10.2	67 ± 7.9		
5.0-10.9	68 ± 5.4	--		69 ± 5.6	68 ± 6.7	69 ± 5.5	66 ± 7.4			
>11.0	70 ± 4.1	76 ± 5.3	69 ± 2.8	75 ± 4.3	62 ± 4.2	75 ± 4.6	60 ± 5.5			
<b>WHITE OAK</b>										
<b>Wood</b>										
1.0- 4.9	64 ± 5.8	--	--				63 ± 6.0	69 ± 4.7		
5.0-10.9	65 ± 3.8	--		66 ± 5.0	64 ± 4.0	66 ± 4.9	61 ± 3.4			
>11.0	68 ± 4.6	72 ± 6.4	66 ± 5.8	71 ± 6.3	63 ± 6.1	71 ± 6.2	61 ± 2.1			
<b>Bark</b>										
1.0- 4.9	92 ± 15.5	--	--				91 ± 16.4	100 ± 15.4		
5.0-10.9	70 ± 13.8	--		68 ± 20.1	71 ± 16.6	68 ± 19.4	78 ± 5.3			
L11.0	67 ± 11.2	62 ± 16.6	64 ± 16.7	63 ± 16.6	69 ± 13.9	63 ± 16.4	74 ± 6.6			
<b>Wood and Bark</b>										
1.0- 4.9	70 ± 6.9	--	--				69 ± 7.7	76 ± 6.1		
5.0-10.9	65 ± 4.7	--		66 ± 6.3	66 ± 6.0	66 ± 6.0	66 ± 2.5			
>11.0	68 ± 4.8	71 ± 6.7	66 ± 6.3	70 ± 6.6	65 ± 7.5	70 ± 6.5	64 ± 2.8			
<b>ALL SPECIES</b>										
<b>Wood</b>										
1.0- 4.9	89 ± 23.1	--	--				89 ± 24.1	88 ± 20.9		
5.0-10.9	89 ± 24.4	--		89 ± 25.3	86 ± 23.5	89 ± 25.1	86 ± 22.9			
>11.0	90 ± 22.4	93 ± 23.8	86 ± 22.2	92 ± 22.9	82 ± 20.8	92 ± 22.9	84 ± 22.0			
<b>Bark</b>										
1.0- 4.9	105 ± 28.0	--	--				103 ± 30.4	117 ± 30.3		
5.0-10.9	91 ± 28.7	--		a7 ± 30.3	98 ± 33.4	88 ± 31.3	107 ± 34.5			
>11.0	85 ± 26.3	80 ± 28.5	82 ± 29.4	80 ± 27.4	96 ± 34.9	80 ± 21.4	101 ± 35.0			
<b>Wood and Bark</b>										
1.0- 4.Y	94 ± 21.2	--	--				92 ± 22.8	99 ± 20.7		
5.0-10.9	89 ± 23.4	--		89 ± 24.0	88 ± 23.0	89 ± 24.0	93 ± 25.1			
>11.0	89 ± 21.2	91 ± 22.4	85 ± 20.8	90 ± 21.5	86 ± 22.0	91 ± 21.6	89 ± 24.7			

**Table 4. --Average proportion of wood and bark green weight in bark, by tree component and size class, for hardwood species in the Piedmont**

Tree size class (inches)	Total tree	Average and standard deviation						Branches	
		Butt to Y-inch top		9-inch to 4-inch top		Butt to 4-inch top			
		Percent	Stem	Percent	Stem	Percent	Stem		
<b>SOFT HARDWOODS</b>									
1.0- 4.9	19 ± 5.5	--	—	—	—	—	17 ± 5.1	30 ± 6.2	
5.0-10.9	15 ± 3.4	--	—	12 ± 3.2	—	20 i-5.0	13 ± 3.4	29 ± 5.4	
>11.0	13 ± 4.1	10 ± 3.9	15 ± 5.5	11 ± 3.9	—	24 ± 8.4	11 ± 3.9	25 ± 6.5	
<b>RED MAPLE</b>									
1.0- 4.9	20 ± 4.0	--	—	—	—	—	18 ± 3.0	28 ± 4.7	
5.0-10.9	14 ± 1.4	--	—	11 ± 1.6	—	17 ± 2.4	12 ± 1.7	26 ± 2.9	
>11.0	15 ± 1.4	11 ± 1.3	13 ± 1.0	11 ± 1.2	—	18 ± 1.8	11 ± 1.2	25 ± 2.6	
<b>SWEETGUM</b>									
1.0- 4.9	19 ± 4.3	--	—	—	—	—	17 ± 4.0	31 ± 4.0	
5.0-10.9	15 ± 2.3	--	—	12 ± 2.1	—	20 ± 4.0	13 ± 2.4	30 ± 3.5	
>11.0	12 ± 1.9	9 ± 1.8	15 ± 3.6	10 ± 1.7	—	26 ± 8.3	10 ± 1.7	26 ± 3.6	
<b>SYCAMORE</b>									
1.0- 4.9	6 ± 1.4	--	—	—	—	—	6 ± 1.0	30 ± 7.7	
5.0-10.9	7 ± 1.3	--	—	5 ± 1.0	—	8 ± 1.4	6 ± 1.2	17 ± 4.7	
>11.0	5 ± 0.7	4 ± 0.6	5 ± 1.0	4 ± 0.6	—	9 ± 1.9	4 ± 0.6	11 ± 2.7	
<b>YELLOW POPLAR</b>									
1.0- 4.9	28 ± 1.6	--	—	—	—	—	25 ± 2.4	51 ± a.7	
5.0-10.9	18 ± 2.6	--	—	16 ± 2.2	—	24 ± 3.2	17 ± 2.4	31 ± 4.7	
>11.0	17 ± 1.8	14 ± 2.3	19 ± 3.4	15 ± 2.2	—	27 ± 3.3	15 ± 2.2	29 ± 3.4	
<b>HARD HARDWOODS</b>									
1.0- 4.9	20 ± 4.9	--	—	—	—	—	19 ± 5.3	26 ± 6.7	
5.0-10.9	18 ± 4.0	--	—	15 ± 4.2	—	22 ± 4.7	16 ± 4.1	29 ± 5.2	
>11.0	16 ± 3.3	12 ± 3.6	16 ± 4.2	13 ± 3.6	—	26 ± 4.2	13 ± 3.6	25 ± 3.6	
<b>ELM</b>									
1.0- 4.9	20 ± 5.1	--	—	—	—	—	18 ± 4.6	28 ± 7.5	
5.0-10.9	13 ± 3.6	--	—	8 ± 2.9	—	19 ± 1.2	10 ± 3.4	23 ± 4.1	
<b>HICKORY</b>									
1.0- 4.9	31 ± 1.9	--	—	—	—	—	33 ± 1.7	37 ± 2.6	
5.0-10.9	27 ± 2.9	--	—	24 i-2.4	—	32 i-3.0	24 ± 2.5	37 ± 3.0	
>11.0	21 ± 3.6	17 ± 4.2	20 ± 3.6	17 ± 4.0	—	27 ± 4.8	17 ± 4.0	30 ± 4.8	
<b>CHESTNUT OAK</b>									
1.0- 4.9	27 ± 3.7	--	—	—	—	—	25 ± 3.4	36 ± 5.5	
5.0-10.9	2 ± 3.0	--	—	19 ± 3.4	—	25 ± 3.6	20 ± 3.5	37 ± 4.7	
>11.0	22 ± 2.4	18 ± 2.4	21 ± 2.8	19 ± 2.5	—	29 ± 3.4	19 ± 2.5	32 ± 6.1	

**Continued**

**Table 4... Average proportion of wood and bark green weight in bark, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-Inch top	4-inch to tip	Butt to tip				
- - - - - Percent - - - - -										
<b>SCARLET OAK</b>										
5.0-10.9	17 ± 1.1	--		13 ± 1.7	19 ± 1.5	14 ± 1.9	20 ± 3.4			
>11.0	16 ± 1.3	13 ± 1.3	14 ± 2.7	13 ± 1.3	22 ± 3.3	13 ± 1.3	22 ± 1.4			
<b>SOUTHERN RED OAK</b>										
1.0- 4.9	24 ± 7.6	--	--	--	--	23 ± 8.7	30 ± 3.0			
5.0-10.9	20 ± 2.0			18 ± 2.5	22 ± 3.2	19 ± 2.1	29 ± 4.2			
>11.0	18 ± 2.3	15 ± 2.4	19 ± 3.8	18 ± 2.7	27 ± 2.1	16 ± 2.7	25 ± 1.9			
<b>WHITE OAK</b>										
1.0- 4.9	22 ± 5.5	--	--	--	22 ± 3.0	20 ± 5.6	37 ± 3.2			
5.0-10.9	17 ± 1.5			13 ± 1.3	14 ± 1.5	28 ± 2.0				
>11.0	14 ± 1.5	10 ± 1.4	13 ± 2.3	10 ± 1.3	27 ± 3.0	10 ± 1.3	24 ± 2.2			
<b>M. SPECIES</b>										
1.0- 4.9	19 ± 5.4	--	--	--	21 ± 3.9	18 ± 5.3	29 ± 6.6			
5.0-10.9	16 ± 4.0	11 ± 3.9	15 ± 5.0	13 ± 4.9	24 ± 6.9	14 ± 3.9	29 ± 5.3			
						12 ± 3.9	25 ± 5.4			

Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		S t e m								
		Butt to 9-inch top	9-inch to 1-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
- - - - - Pounds per cubic foot - - - - -										
<b>SOFT HARDWOODS</b>										
<b>Wbod</b>										
1.0- 4.9	<b>60 ± 5.9</b>	--	--	--	--		<b>60 ± 6.0</b>	<b>59 ± 1.5</b>		
5.0-10.9	<b>60 ± 4.7</b>	--	--	<b>60 ± 5.0</b>	<b>59 ± 5.9</b>		<b>60 ± 4.9</b>	<b>60 ± 4.5</b>		
>11.0	<b>61 ± 3.9</b>	<b>61 ± 4.6</b>	<b>61 ± 4.8</b>	<b>61 ± 4.4</b>	<b>58 ± 4.0</b>		<b>61 ± 4.4</b>	<b>60 ± 3.2</b>		
<b>Bark</b>										
1.0- 4.9	<b>50 ± 9.0</b>	--	--	--	--		<b>49 ± 10.3</b>	<b>59 ± 10.9</b>		
5.0-10.9	<b>52 ± 8.0</b>	--	--	<b>50 ± 10.1</b>	<b>57 ± 7.3</b>		<b>51 ± 9.3</b>	<b>59 ± 5.1</b>		
>11.0	<b>55 ± 7.3</b>	<b>53 ± 9.5</b>	<b>55 ± 8.2</b>	<b>53 ± 9.1</b>	<b>60 ± 6.0</b>		<b>53 ± 9.0</b>	<b>59 ± 4.0</b>		
<b>Wbod and Bark</b>										
1.0- 4.9	<b>58 ± 4.8</b>	--	--	--	--		<b>58 ± 5.0</b>	<b>59 ± 6.3</b>		
5.0-10.9	<b>59 ± 4.0</b>	--	--	<b>58 ± 4.4</b>	<b>59 ± 4.9</b>		<b>58 ± 4.3</b>	<b>59 ± 3.9</b>		
>11.0	<b>60 ± 3.8</b>	<b>60 ± 4.5</b>	<b>59 ± 4.4</b>	<b>60 ± 4.3</b>	<b>58 ± 3.4</b>		<b>60 ± 4.3</b>	<b>59 ± 2.9</b>		
<b>RED MAPLE</b>										
<b>Wbod</b>										
1.0- 4.9	<b>54 ± 5.5</b>	--	--	--	--		<b>54 ± 5.7</b>	<b>51 ± 4.6</b>		
5.0-10.9	<b>55 ± 2.7</b>	--	--	<b>55 ± 3.1</b>	<b>54 ± 3.9</b>		<b>55 ± 3.0</b>	<b>55 ± 4.3</b>		
>11.0	<b>55 ± 3.6</b>	<b>55 ± 4.2</b>	<b>52 ± 3.2</b>	<b>54 ± 3.9</b>	<b>55 ± 4.1</b>		<b>54 ± 3.8</b>	<b>57 ± 3.3</b>		
<b>Bark</b>										
1.0- 4.9	<b>57 ± 4.9</b>	--	--	--	--		<b>59 ± 3.8</b>	<b>54 ± 9.3</b>		
5.0-10.9	<b>60 ± 3.4</b>	--	--	<b>61 ± 5.3</b>	<b>61 ± 3.0</b>		<b>61 ± 4.7</b>	<b>57 ± 4.2</b>		
>11.0	<b>64 ± 4.2</b>	<b>66 ± 4.7</b>	<b>67 ± 2.8</b>	<b>66 ± 3.8</b>	<b>67 ± 2.2</b>		<b>66 ± 3.7</b>	<b>60 ± 5.1</b>		
<b>Wbod and Bark</b>										
1.0- 4.9	<b>54 ± 4.8</b>	--	--	--	--		<b>55 ± 4.9</b>	<b>52 ± 4.6</b>		
5.0-10.9	<b>55 ± 2.4</b>	--	--	<b>55 ± 3.1</b>	<b>55 ± 3.3</b>		<b>55 ± 2.9</b>	<b>55 ± 3.3</b>		
>11.0	<b>56 ± 3.4</b>	<b>56 ± 4.0</b>	<b>53 ± 3.1</b>	<b>56 ± 3.6</b>	<b>56 ± 3.8</b>		<b>56 ± 3.6</b>	<b>58 ± 3.3</b>		
<b>SWEETGUM</b>										
<b>Wbod</b>										
1.0- 4.9	<b>62 ± 4.6</b>	--	--	--	--		<b>62 ± 4.7</b>	<b>61 ± 6.0</b>		
5.0-10.9	<b>62 ± 3.4</b>	--	--	<b>63 ± 3.8</b>	<b>62 ± 4.8</b>		<b>63 ± 3.6</b>	<b>62 ± 3.4</b>		
>11.0	<b>63 ± 2.3</b>	<b>63 ± 2.9</b>	<b>63 ± 2.9</b>	<b>63 ± 2.7</b>	<b>59 ± 3.8</b>		<b>63 ± 2.6</b>	<b>61 ± 2.7</b>		
<b>Bark</b>										
1.0- 4.9	<b>45 ± 1.0</b>	--	--	--	--		<b>44 ± 1.8</b>	<b>59 ± 6.5</b>		
5.0-10.9	<b>48 ± 6.0</b>	--	--	<b>44 ± 7.1</b>	<b>55 ± 6.1</b>		<b>46 ± 6.6</b>	<b>60 ± 3.4</b>		
>11.0	<b>52 ± 4.6</b>	<b>49 ± 6.4</b>	<b>51 ± 5.6</b>	<b>50 ± 5.9</b>	<b>58 ± 5.0</b>		<b>50 ± 5.8</b>	<b>59 ± 3.4</b>		

Continued

**Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation							Branches					
		Stem												
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip								
<u>Pounds per cubic foot</u>														
<b>Wood and Bark</b>														
1.0- 4.9	58 ± 3.2	--	--	--	--	--	57 ± 3.5	61 ± 5.4						
5.0-10.9	60 ± 3.4	--	--	59 ± 3.8	60 ± 4.1	60 ± 3.6	61 ± 2.9							
>11.0	61 ± 2.3	62 ± 3.0	61 ± 2.7	62 ± 2.8	59 ± 3.3	62 ± 2.1	61 ± 2.5							
<b>SYCAMORE</b>														
<b>Wood</b>														
1.0- 4.9	66 ± 5.7	--	--	64 ± 2.3	--	67 ± 5.9	56 ± 7.1							
5.0-10.9	64 ± 2.3	--	--	63 ± 3.9	65 ± 4.6	64 ± 2.6	63 ± 2.2							
>11.0	64 ± 4.2	66 ± 5.0	69 ± 3.9	69 ± 2.5	60 ± 2.8	65 ± 4.6	58 ± 3.2							
<b>Bark</b>														
1.0- 4.9	63 ± 4.4	--	--	69 ± 3.4	--	62 ± 5.3	75 ± 17.5							
5.0-10.9	68 ± 2.9	--	--	69 ± 2.5	71 ± 3.3	69 ± 3.1	67 ± 5.0							
>11.0	67 ± 2.6	69 ± 2.4	69 ± 2.9	69 ± 2.5	68 ± 5.7	69 ± 2.5	66 ± 5.1							
<b>Wood and Bark</b>														
1.0- 4.9	66 ± 5.4	--	--	65 ± 2.2	--	66 ± 5.7	60 ± 3.3							
5.0-10.9	64 ± 2.2	--	--	64 ± 3.8	65 ± 4.4	65 ± 2.6	63 ± 2.4							
>11.0	64 ± 4.1	66 ± 4.8	64 ± 3.8	65 ± 4.4	61 ± 2.7	65 ± 4.4	58 ± 3.1							
<b>YELLOW POPLAR</b>														
<b>Wood</b>														
1.0- 4.9	54 ± 5.3	--	--	56 ± 4.7	--	54 ± 5.7	53 ± 2.2							
5.0-10.9	56 ± 4.2	--	--	59 ± 4.0	58 ± 2.8	53 ± 4.5	56 ± 3.7							
>11.0	58 ± 2.4	58 ± 2.8	59 ± 4.0	58 ± 2.8	58 ± 3.8	58 ± 2.8	59 ± 1.5							
<b>Bark</b>														
1.0- 4.9	56 ± 2.0	--	--	55 ± 7.4	--	55 ± 2.8	57 ± 2.4							
5.0-10.9	55 ± 6.0	--	--	53 ± 5.6	50 ± 6.7	59 ± 5.7	55 ± 4.6							
>11.0	52 ± 5.4	50 ± 7.0	53 ± 5.6	50 ± 6.7	58 ± 4.8	50 ± 6.6	56 ± 3.4							
<b>Wood and Bark</b>														
1.0- 4.9	54 ± 3.9	--	--	56 ± 4.4	--	54 ± 4.4	55 ± 1.9							
5.0-10.9	55 ± 3.8	--	--	57 ± 3.8	57 ± 2.6	55 ± 4.2	56 ± 3.3							
>11.0	57 ± 2.3	57 ± 2.5	57 ± 3.8	57 ± 2.6	58 ± 3.2	57 ± 2.6	58 ± 1.5							
<b>HARD HARDWOODS</b>														
<b>Wood</b>														
1.0- 4.9	64 ± 4.7	--	--	64-i 5.5	--	64 ± 4.9	65 ± 6.2							
5.0-10.9	64 ± 4.6	--	--	66 ± 4.4	63 ± 5.1	64 ± 5.1	64 ± 3.7							
>11.0	66 ± 3.8	66 ± 4.6	67 ± 4.8	66 ± 4.4	66 ± 6.3	66 ± 4.4	66 ± 2.4							

**Continued**

**Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation							
		Stem							
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip	Branches		
<u>Pounds per cubic foot</u>									
<b>Bark</b>									
1.0- 4.9	<b>51 ± 10.6</b>	—	—	—	—	—	—	—	
5.0-10.9	<b>57 ± 5.3</b>	—	—	—	—	—	—	—	
≥11.0	60 ± 7.7	61 ± 5.6	61 ± 5.2	61 ± 5.4	60 ± 3.9	61 ± 5.3	60 ± 4.2	—	
<b>Wood and Bark</b>									
1.0- 4.9	<b>61 ± 5.2</b>	—	—	—	—	—	—	—	
5.0-10.9	<b>63 ± 4.1</b>	—	—	—	—	—	—	—	
≥11.0	65 ± 3.3	65 ± 4.1	66 ± 4.0	66 ± 4.0	64 ± 4.7	66 ± 3.9	64 ± 2.6	—	
<b>ELM</b>									
<b>Wood</b>									
1.0- 4.9	63 ± 4.2	—	—	—	—	—	—	—	
5.0-10.9	61 ± 1.8	—	—	—	—	—	—	—	
Bark									
1.0- 4.9	46 ± 6.1	—	—	—	—	—	—	—	
5.0-10.9	48 ± 4.9	—	—	—	—	—	—	—	
Wood and Bark									
1.0- 4.9	58 ± 2.6	—	—	—	—	—	—	—	
5.0-10.9	59 ± 1.7	—	—	—	—	—	—	—	
<b>HICKORY</b>									
<b>Wood</b>									
1.0- 4.9	57 ± 1.7	—	—	—	—	—	—	—	
5.0-10.9	58 ± 2.2	—	—	—	—	—	—	—	
≥11.0	62 ± 4.2	62 ± 5.4	61 ± 2.3	62 ± 5.0	58 ± 3.0	62 ± 5.0	61 ± 2.2	—	
Bark									
1.0- 4.9	61 ± 0.8	—	—	—	—	—	—	—	
5.0-10.9	57 ± 1.8	—	—	—	—	—	—	—	
≥11.0	59 ± 2.0	60 ± 2.0	61 ± 2.6	61 ± 2.0	60 ± 2.3	60 ± 1.9	56 ± 2.9	—	
Wood and Bark									
1.0- 4.9	59 ± 1.3	—	—	—	—	—	—	—	
5.0-10.9	58 ± 1.6	—	—	—	—	—	—	—	
≥11.0	61 ± 3.3	62 ± 4.6	61 ± 1.9	62 ± 4.2	59 ± 3.2	62 ± 4.2	60 ± 2.0	—	

*Continued*

**Table 5.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation Stem						Branches		
		Butt to 9-inch top	9-inch to 4-inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<b>pounds per cubic foot</b>										
<b>CHESTNUT DAK</b>										
<b>Wood</b>										
1.0- 4.9	60 ± 3.4	--	--	--	--	60 ± 3.5	60 ± 5.0			
5.0-10.9	61 ± 2.8	--	--	61 ± 3.1	60 ± 6.7	61 ± 3.0	61 ± 3.3			
≥11.0	59 ± 2.6	57 ± 3.3	62 ± 3.4	50 ± 3.4	57 ± 2.9	58 ± 3.3	62 ± 2.6			
<b>Bark</b>										
1.0- 4.9	56 ± 2.8	--	--	--	--	56 ± 3.1	64 ± 12.0			
5.0-10.9	53 ± 2.2	--	--	53 ± 2.0	54 ± 2.9	53 ± 2.1	56 ± 3.4			
≥11.0	55 ± 0.5	56 ± 2.1	55 ± 3.1	55 ± 2.3	56 ± 0.1	55 ± 2.3	55 ± 2.5			
<b>Wood and Bark</b>										
1.0- 4.9	59 ± 2.7	--	--	--	--	59 ± 2.9	61 ± 3.5			
5.0-10.9	59 ± 2.4	--	--	59 ± 2.1	58 ± 4.5	59 ± 2.6	59 ± 3.0			
≥11.0	58 ± 2.1	57 ± 3.1	60 ± 3.4	58 ± 3.1	57 ± 2.1	58 ± 3.0	59 ± 2.2			
<b>SCARLET OAK</b>										
<b>Wood</b>										
5.0-10.9	68 ± 3.0	--	--	69 ± 3.8	63 ± 2.6	68 ± 3.7	65 ± 0.8			
≥11.0	66 ± 2.8	66 ± 4.0	69 ± 3.5	67 ± 3.7	69 ± 4.8	67 ± 3.6	66 ± 0.8			
<b>Bark</b>										
5.0-10.9	62 ± 2.2	--	--	65 ± 2.6	62 ± 3.1	64 ± 2.9	58 ± 0.5			
≥11.0	63 ± 1.4	66 ± 3.0	66 ± 2.9	66 ± 2.6	63 ± 2.5	65 ± 2.5	60 ± 1.5			
<b>Wood and Bark</b>										
5.0-10.9	67 ± 2.5	--	--	69 ± 3.5	63 ± 2.4	68 ± 3.4	63 ± 0.6			
≥11.0	66 ± 2.3	66 ± 3.6	68 ± 3.0	66 ± 3.3	67 ± 3.8	66 ± 3.3	64 ± 0.6			
<b>SOUTHERN RED OAK</b>										
<b>Wood</b>										
1.0- 4.9	61 ± 5.6	--	--	--	--	60 ± 6.3	65 ± 0.3			
5.0-10.9	67 ± 2.5	--	--	67 ± 3.5	68 ± 4.1	67 ± 3.0	66 ± 2.1			
≥11.0	65 ± 4.3	65 ± 5.2	67 ± 5.6	65 ± 5.1	67 ± 8.7	65 ± 5.1	65 ± 1.6			
<b>Bark</b>										
1.0- 4.9	63 ± 0.2	--	--	--	--	65 ± 1.5	57 ± 3.9			
5.0-10.9	62 ± 2.7	--	--	62 ± 4.1	64 ± 4.0	62 ± 4.0	61 ± 2.1			
≥11.0	63 ± 2.6	64 ± 5.3	63 ± 2.4	64 ± 4.4	63 ± 2.5	64 ± 4.3	63 ± 1.2			

**Continued**

**Table S.--Average green weight per cubic foot of wood, bark, and wood and bark combined, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	Average and standard deviation							Branches		
		Stem									
		Butt 9-inch top	9-inch to 4-Inch top	Butt 4-inch top	4-inch to tip	Butt tip	Butt tip	Butt tip			
<b>Pounds per cubic foot</b>											
<b>Wood and Bark</b>											
1.0- 4.9	<b>61 ± 4.2</b>		--	--	--		61 ± 4.9	62 ± 0.4			
5.0-10.9	<b>66 ± 2.1</b>	--	--	<b>66 ± 3.0</b>	67 ± 2.5	66 ± 2.5	64 ± 1.1				
<u>&gt;11.0</u>	<b>65 ± 3.7</b>	<b>65 ± 4.8</b>	<b>66 ± 4.5</b>	<b>65 ± 4.6</b>	66 ± 6.0	65 ± 4.6	64 ± 1.1				
<b>WHITE OAK</b>											
<b>Wood</b>											
1.0- 4.9	<b>62 ± 5.1</b>	--	--	--			62 ± 5.1	64 ± 3.0			
5.0-10.9	<b>66 ± 2.9</b>	--	--	<b>67 ± 3.4</b>	65 ± 3.7	67 ± 3.3	64 ± 2.6				
<u>&gt;11.0</u>	<b>68 ± 2.1</b>	<b>68 ± 2.8</b>	<b>69 ± 3.6</b>	<b>69 ± 2.7</b>	67 ± 3.8	69 ± 2.7	67 ± 1.2				
<b>Bark</b>											
1.0- 4.9	<b>55 ± 3.1</b>	--	--	--			55 ± 3.8	59 ± 8.6			
5.0-10.9	<b>55 ± 5.7</b>	--	--	<b>53 ± 6.5</b>	55 ± 5.6	53 ± 6.3	60 ± 5.3				
<u>&gt;11.0</u>	<b>59 ± 3.9</b>	<b>58 ± 5.4</b>	<b>58 ± 5.6</b>	<b>58 ± 5.3</b>	59 ± 4.3	58 ± 5.3	61 ± 5.5				
<b>Wood and Bark</b>											
1.0- 4.9	<b>61 ± 4.6</b>		--	--	--		61 ± 4.8	62 ± 3.6			
5.0-10.9	<b>64 ± 3.0</b>	--	--	<b>65 ± 3.7</b>	62 ± 3.2	64 ± 3.6	63 ± 1.1				
<u>&gt;11.0</u>	<b>67 ± 2.0</b>	<b>67 ± 2.6</b>	<b>68 ± 2.7</b>	<b>67 ± 2.5</b>	64 ± 2.5	67 ± 2.5	66 ± 2.3				
<b>ALL SPECIES</b>											
<b>Wood</b>											
1.0- 4.9	<b>62 ± 5.8</b>		--	--	--		62 ± 5.8	61 ± 7.6			
5.0-10.9	<b>62 ± 5.1</b>	--	--	<b>62 ± 5.6</b>	61 ± 5.9	62 ± 5.4	61 ± 4.6				
<u>&gt;11.0</u>	<b>63 ± 4.7</b>	<b>63 ± 5.1</b>	<b>63 ± 5.8</b>	<b>63 ± 5.1</b>	62 ± 6.4	63 ± 5.1	62 ± 4.2				
<b>Bark</b>											
1.0- 4.9	<b>50 ± 9.5</b>		--	--	--		50 ± 10.4	57 ± 11.9			
5.0-10.9	<b>54 ± 7.5</b>	--	--	<b>53 ± 9.7</b>	57 ± 6.9	54 ± 9.0	59 ± 5.0				
<u>&gt;11.0</u>	<b>57 ± 6.6</b>	<b>56 ± 8.9</b>	<b>58 ± 7.6</b>	<b>56 ± 8.5</b>	60 ± 5.2	57 ± 8.4	59 ± 4.6				
<b>Wood and Bark</b>											
1.0- 4.9	<b>59 ± 5.1</b>	--	--	--	--		59 ± 5.1	60 ± 6.9			
5.0-10.9	<b>60 ± 4.6</b>	--	--	--	60 ± 5.3	60 ± 4.9	60 ± 3.8				
<u>&gt;11.0</u>	<b>62 ± 4.5</b>	<b>62 ± 5.1</b>	62 ± 5.4	62 ± 5.0	61 ± 5.0	62 ± 5.0	61 ± 3.8				

**Table 6. --Average green weight of wood and bark per cubic foot of wood, by tree component and size class, for hardwood species in the Piedmont**

Tree size class (inches)	Total tree	Average and standard deviation						Branches		
		Butt to 9-inch top	9-inch to 4-Inch top	Butt to 4-inch top	4-inch to tip	Butt to tip				
<b>Pounds per cubic foot</b>										
<b>SOFT HARDWOODS</b>										
1.0- 4.9	74 ± 5.4	--	--	--	--	73 ± 5.5	85 ± 10.4			
5.0-10.9	71 ± 5.1	--	--	69 ± 5.1	74 ± 6.9	69 ± 5.2	84 ± 8.2			
>11.0	70 ± 3.8	68 ± 4.0	<b>71 ± 6.1</b>	<b>69 ± 4.0</b>	77 ± 9.4	69 ± 4.0	80 ± 7.5			
<b>RED MAPLE</b>										
1.0- 4.9	67 ± 4.1	--	--	--	--	66 ± 4.5	71 ± 6.3			
5.0-10.9	64 ± 3.4	--	--	62 ± 3.8	66 ± 4.7	62 ± 3.8	73 ± 7.0			
>11.0	64 ± 4.6	62 ± 5.3	60 ± 4.4	61 ± 4.9	66 ± 5.6	62 ± 4.9	76 ± 5.0			
<b>SWEETGUM</b>										
1.0- 4.9	76 ± 3.8	--	--	--	--	75 ± 4.0	90 ± 8.5			
5.0-10.9	73 ± 4.0	--	--	71 ± 4.1	77 ± 6.0	72 ± 4.1	89 ± 5.4			
>11.0	72 ± 2.7	70 ± 3.1	<b>74 ± 4.4</b>	<b>70 ± 2.9</b>	80 ± 9.4	<b>70 ± 2.9</b>	83 ± 4.7			
<b>SYCAMORE</b>										
1.0- 4.9	71 ± 6.3	--	--	--	--	71 ± 6.2	80 ± 5.1			
5.0-10.9	69 ± 1.9	--	--	68 ± 2.0	70 ± 4.7	68 ± 2.2	75 ± 3.9			
>11.0	67 ± 4.4	68 ± 5.0	<b>66 ± 4.4</b>	<b>68 ± 4.6</b>	66 ± 2.7	68 ± 4.6	65 ± 4.0			
<b>YELLOW POPLAR</b>										
1.0- 4.9	75 ± 7.2	--	--	--	--	72 ± 5.5	91 ± 9.0			
5.0-10.9	68 ± 4.6	--	--	66 ± 4.9	71 ± 6.2	67 ± 4.7	a2 ± 0.3			
>11.0	70 ± 2.9	68 ± 3.1	73 ± 4.9	69 ± 3.1	80 ± 6.1	69 ± 3.1	83 ± 4.1			
<b>HARD HARDWOODS</b>										
1.0- 4.9	81 ± 4.7	--	--	--	--	79 ± 5.1	88 ± 6.9			
5.0-10.9	79 ± 6.1	--	--	76 ± 6.7	81 ± 6.4	77 ± 6.3	90 ± 7.7			
>11.0	79 ± 3.5	75 ± 4.0	80 ± 5.0	76 ± 4.0	89 ± 8.3	76 ± 4.0	87 ± 3.2			
<b>ELM</b>										
1.0- 4.9	79 ± 4.7	--	--	--	--	77 ± 5.3	85 ± 9.5			
5.0-10.9	70 ± 4.4	--	--	68 ± 4.2	73 ± 3.9	68 ± 4.1	79 ± 6.8			
<b>HICKORY</b>										
1.0- 4.9	83 ± 0.6	--	--	--	--	83 ± 1.4	83 ± 9.9			
5.0-10.9	81 ± 4.9	--	--	76 ± 2.7	79 ± 2.9	77 ± 2.7	96 ± 6.9			
>11.0	78 ± 3.7	75 ± 4.2	76 ± 1.8	75 ± 3.7	80 ± 2.3	75 ± 3.6	88 ± 4.6			
<b>CHESTNUT OAK</b>										
1.0- 4.9	82 ± 1.9	--	--	--	--	80 ± 2.0	98 ± 4.4			
5.0-10.9	70 ± 2.0	--	--	76 ± 3.2	80 ± 8.6	76 ± 3.1	97 ± 7.6			
>11.0	76 ± 1.0	70 ± 2.1	79 ± 1.5	72 ± 2.1	80 ± 5.8	72 ± 2.1	90 ± 4.7			

**Continued**

**Table 6--Average green weight of wood and bark per cubic foot of wood, by tree component and size class, for hardwood species in the Piedmont--Continued**

Tree size class (inches)	Total tree	<b>Average and standard deviation</b>															
		<b>S t e m</b>															
		<b>Butt to 9-inch top</b>	<b>9-inch to 4-inch top</b>	<b>Butt to 4-inch top</b>	<b>4-inch to tip</b>	<b>Butt to tip</b>	<b>Branches</b>										
		<b>Pounds</b>															
<b>per cubic foot</b>																	
<b>SCARLET OAK</b>																	
5.0-10.9	<b>81</b>	<b>±</b>	<b>3.1</b>														
>11.0	<b>79</b>	<b>±</b>	<b>3.2</b>	<b>76</b>	<b>±</b>	<b>4.1</b>											
				80	--	80	±	3.4									
						76	±	3.8									
						88	±	4.5									
							79	±	3.3								
							77	±	3.7								
							85	±	1.7								
<b>SOUTHERN RED OAK</b>																	
1.0- 4.9	80	±	0.6														
5.0-10.9	<b>84</b>	<b>±</b>	<b>2.9</b>	--													
>11.0	<b>80</b>	<b>±</b>	<b>4.5</b>	<b>76</b>	<b>±</b>	<b>5.2</b>											
				83	--	82	±	3.7									
						88	±	8.1									
							83	±	3.7								
							93	±	7.7								
							78	±	5.4								
							87	±	2.3								
<b>WHITE OAK</b>																	
1.0- 4.9	<b>79</b>	<b>±</b>	<b>1.8</b>	--													
5.0-10.9	<b>80</b>	<b>±</b>	<b>3.8</b>	--													
>11.0	<b>79</b>	<b>±</b>	<b>2.4</b>	<b>76</b>	<b>±</b>	<b>2.0</b>											
				80	±	4.0											
						77	±	3.0									
							93	±	5.3								
							78	±	3.0								
							76	±	2.7								
							89	±	4.3								
<b>ALL SPECIES</b>																	
1.0- 4.9	<b>76</b>	<b>±</b>	<b>6.0</b>	--													
5.0-10.9	<b>74</b>	<b>±</b>	<b>6.1</b>	--													
>11.0	<b>74</b>	<b>±</b>	<b>5.6</b>	<b>71</b>	<b>±</b>	<b>5.3</b>											
				75	--	72	±	7.0									
						72	±	6.8									
							77	±	7.5								
							82	±	10.6								
							72	±	5.4								
							83	±	7.0								

**Table 7. --Keyression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable**

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h.	Trees > 11.0 in d.b.h.	a'	b	a"	b	
<b>TOTAL-TREE WOOD, BARK, AND FOLIAGE</b>								
<b>Soft Hardwoods</b>	Green	3.73782	1.24651	3.72881	1.24702	0.99	0.0743	435
	Dry	1.84450	1.74271	1.79335	1.24857	0.99	0.0859	435
Red maple	Green	5.36391	1.15934	6.98338	1.10433	0.99	0.0617	32
	Dry	2.79850	1.17348	2.67230	1.18311	0.99	0.0616	32
Sweetgum	Green	3.52244	1.25422	2.73784	1.30676	0.99	0.0660	236
	Dry	1.59389	1.26123	1.11956	1.33488	0.99	0.0691	236
Sycamore	Green	3.45877	1.29420	5.69330	1.19029	0.98	0.0914	2Y
	Dry	1.57573	1.29005	2.51502	1.19256	0.98	0.0903	29
Yellow-poplar	Green	5.34413	1.16528	3.86208	1.23301	0.99	0.0563	78
	WY	2.26626	1.19993	2.07889	1.21792	0.99	0.0569	78
<b>Hard Hardwoods</b>	Green	4.37384	1.24797	3.77719	1.27855	0.99	0.0831	338
	Dry	2.33125	1.27239	2.65719	1.24510	0.99	0.0832	338
Elm species	Green	3.55150	1.29029		-	0.99	0.1089	16
	Dry	2.17565	1.24810		-	0.98	0.1497	16
Hickory species	Green	3.91388	1.25991	2.07847	1.39188	0.99	0.0875	22
	Dry	2.28678	1.26943	1.45618	1.36354	0.99	0.0817	22
Chestnut oak	Green	3.58393	1.26451		-	0.98	0.1001	37
	Dry	2.07216	1.27407		-	0.99	0.0952	37
Scarlet oak	Green	7.67883	1.12892	5.18502	1.21080	0.98	0.0584	32
	Dry	4.62402	1.11826	3.25755	1.19130	0.97	0.0619	32
South. red oak	Green	4.16110	1.24480	3.59805	1.27512	0.99	0.0619	48
	Dry	2.30252	1.25795	2.23731	1.26394	0.99	0.0658	48

Continued

**Table 7.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued**

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled
		Trees $\leq 11.0$ in d.b.h. <sup>1</sup>	b	a''	b			
<b>White oak</b>	Green	<b>3. 77906</b>	<b>1. 28582</b>	<b>4. 12381</b>	<b>1. 26762</b>	<b>0. 99</b>	<b>0. 0628</b>	110
	Dry	<b>2. 171351</b>	<b>1. 29463</b>	<b>2. 75327</b>	<b>1. 24504</b>	<b>0. 99</b>	<b>0. 0639</b>	110
<b>All Species</b>	Green	<b>4. 02178</b>	<b>1. 24683</b>	<b>3. 77086</b>	<b>1. 26026</b>	<b>0. 99</b>	0.0858	773
	Dry	<b>2. 07266</b>	<b>1. 25582</b>	<b>2. 17269</b>	<b>1. 24599</b>	<b>0. 98</b>	0.1127	773
<b>TOTAL-TREE WOOD AND BARK</b>								
<b>Soft Hardwoods</b>	Green	<b>3. 45441</b>	1.25662	3.56126	1.25027	0.99	0.0735	435
	Dry	<b>1. 76000</b>	1.024794	1.70240	1.25488	0.99	0.0858	435
<b>Red maple</b>	Green	<b>4. 67742</b>	1.18264	8.54253	1.05705	0.99	0.0644	32
	Dry	<b>2. 57712</b>	1.18599	3.05746	1.15035	0.99	0.0644	32
<b>Sweetgum</b>	Green	<b>3. 27747</b>	1.26281	2.52632	1.31709	0.99	0.0656	236
	Dry	<b>1. 53102</b>	1.26483	1.02343	1.34881	0.99	0.0700	236
<b>Sycamore</b>	Green	<b>3. 45375</b>	1.28604	5.53455	1.18772	<b>0. 98</b>	0.0896	29
	Dry	<b>1. 59196</b>	1.28224	2.49193	1.18881	0.98	0.0892	29
<b>Yellow-poplar</b>	Green	<b>4. 85459</b>	1.17925	3.70384	1.23567	0.99	0.0565	78
	Dry	<b>2. 15905</b>	1.20611	1.99365	1.22273	0.99	0.0577	78
<b>Hard Hardwoods</b>	Green	<b>3. 94158</b>	1.26290	3.78872	1.27115	0.99	0.0816	338
	Dry	<b>2. 19726</b>	1.27902	2.63110	1.24145	0.99	0.0824	338
<b>Elm species</b>	Green	<b>3. 24468</b>	1.30218	-	-	0.99	0.1080	16
	Dry	<b>2. 04282</b>	1.25462	-	-	0.98	0.1487	16
<b>Hickory species</b>	Green	<b>3. 54512</b>	1.27159	1.96464	1.39467	0.99	0.0849	22
	Dry	<b>2. 12752</b>	1.27670	1.40563	1.36312	0.99	<b>0. 0809</b>	22
<b>Chestnut oak</b>	Green	<b>3. 36285</b>	1.26827	-	-	0.99	0.0953	37
	Dry	<b>1. 97742</b>	1.27701	-	-	0.99	<b>0.0919</b>	37

**Continued**

**Table 7. --Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued**

<b>Species or species group</b>	<b>Weight green or dry</b>	<b>Regression equation coefficients</b>				<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S<sub>y,x</sub>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>	<b>b</b>	<b>a''</b>	<b>b</b>			
<b>Scarlet oak</b>	<b>Green</b>	6.97167	1.14034	<b>5. 08292</b>	<b>1. 20623</b>	<b>0. 98</b>	0.0513	32
	<b>Dry</b>	<b>4. 29269</b>	1.12622	<b>3. 29755</b>	<b>1. 15121</b>	0.98	0.0557	32
<b>South. red oak</b>	<b>Green</b>	3.79154	1.25816	3.65002	1.26610	0.99	<b>0. 0650</b>	<b>48</b>
	<b>Dry</b>	2.16190	1.26622	2.24331	1.25852	0.99	<b>0. 0674</b>	<b>48</b>
<b>White oak</b>	<b>Green</b>	3.59943	1.28743	3.83734	1.27409	0.99	0.0624	110
	<b>Dry</b>	<b>2. 10740</b>	1.29427	2.61564	1.24922	0.99	0.0636	110
<b>All Species</b>	<b>Green</b>	<b>3. 67241</b>	1.25923	3.68006	1.25879	0.99	0.0840	773
	<b>Dry</b>	<b>1. 96533</b>	1.26171	2.09786	1.24810	0.98	0.1113	773
<b>TOTAL-TREE WOOD</b>								
<b>Soft Hardwoods</b>	<b>Green</b>	2.69151	1.27896	3.09999	1.24950	0.99	0.0783	435
	<b>Dry</b>	1.40258	1.26551	1.50675	1.25057	0.99	0.0898	435
<b>Red maple</b>	<b>Green</b>	3.59496	1.21112	10.15858	0.99452	0.99	0.0685	32
	<b>Dry</b>	2.00850	1.21442	3.30769	1.11040	0.99	0.0683	32
<b>Sweetgum</b>	<b>Green</b>	2.53317	1.28762	<b>2.11801</b>	1.32495	0.99	<b>0. 0690</b>	236
	<b>Dry</b>	1.21586	1.28167	0.86858	1.35180	0.99	0.0737	236
<b>Sycamore</b>	<b>Green</b>	3.18226	1.29035	4.93410	1.19890	0.98	<b>0.0917</b>	29
	<b>Dry</b>	1.46669	1.28586	2.28758	1.19318	0.98	<b>0. 0914</b>	<b>29</b>
<b>Yellow poplar</b>	<b>Green</b>	3.21823	1.22820	3.20054	1.22935	0.99	0.0567	78
	<b>Dry</b>	1.49256	1.25062	1.83348	1.20772	0.99	0.0597	78
<b>Hard Hardwoods</b>	<b>Green</b>	3.07161	1.27581	2.83843	1.29227	0.99	0.0903	338
	<b>Dry</b>	1.79309	1.28120	2.00363	1.25805	0.99	0.0904	338
<b>Elm species</b>	<b>Green</b>	2.47940	1.33256	-	-	0.99	0.1060	<b>16</b>
	<b>Dry</b>	1.61626	1.27640	-	-	0.98	<b>0. 1500</b>	<b>16</b>

**Continued**

**Table 7. --Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued**

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y.x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b			
<b>Hickory species</b>	Green	2.39541	1.29158	0.95325	<b>1.48372</b>	<b>0.99</b>	0.0801	22
	Dry	<b>1.47448</b>	<b>1.30237</b>	0.80484	<b>1.42846</b>	<b>0.99</b>	<b>0.0812</b>	2%
<b>Chestnut oak</b>	Green	2.38060	<b>1.295' 36</b>			<b>0.98</b>	<b>0.1038</b>	37
	Dry	1.47803	<b>1.29164</b>			0.98	<b>0.1052</b>	37
<b>Scarlet oak</b>	Green	<b>5.64242</b>	<b>1.14657</b>	<b>3.91334</b>	1.22288	<b>0.98</b>	<b>0.0514</b>	32
	Dry	<b>3.58160</b>	<b>1.12404</b>	<b>2.65478</b>	<b>1.18648</b>	<b>0.98</b>	0.0569	32
<b>South. red oak</b>	Green	<b>2.69921</b>	<b>1.25577</b>	<b>2.75307</b>	1.28165	<b>0.99</b>	<b>0.0686</b>	48
	Dry	1.60609	<b>1.28082</b>	<b>1.75184</b>	1.26271	0.98	0.0701	48
<b>White oak</b>	Green	2.61921	<b>1.32022</b>	<b>3.09258</b>	<b>1.28557</b>	<b>0.99</b>	<b>0.0646</b>	110
	Dry	1.62310	<b>1.315413</b>	<b>2.16091</b>	1.25581	<b>0.99</b>	<b>0.0655</b>	110
<b>All Species</b>	Green	2.86050	<b>1.27724</b>	2.99656	1.26756		0.0577	773
	Dry	1.58099	1.27211	1.72962	1.25335	0.98	0.1114	773

<sup>1</sup>Trees < 11.0 inches d.b.h.

$$Y = a'(D^2)^b$$

<sup>2</sup>Trees > 11.0 inches d.b.h.

$$Y = a''(D^2)^b$$

Where: Y = component weight in pounds  
 D = tree d.b.h. in inches  
 a', a'', b = regression coefficients

<sup>3</sup>log<sub>e</sub> form

**Table 8.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable**

<b>Species or species group</b>	<b>Height green or dry</b>	<b>Regression equation coefficients</b>				<b>Coefficient of determination (<math>R^2</math>)</b>	<b>Standard error<sup>3</sup> (<math>S_{y,x}</math>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>	<b>b</b>	<b>a''</b>	<b>b</b>			
<b>TOTAL-STEM WOOD AND BARK</b>								
<b>Soft Hardwoods</b>	Green	2.88400	1.26739	<b>4. 62115</b>	1.16908	0.99	0.0760	<b>435</b>
	Dry	<b>1. 46664</b>	1.25919	<b>2. 23750</b>	1.17111	0.99	0.0848	<b>435</b>
<b>Red maple</b>	Green	3.43218	1.21974	36.05579	0.72933	0.99	0.0830	32
	Dry	<b>1. 89307</b>	1.27502	11.29115	0.85265	0.99	0.0856	32
<b>Sweetgum</b>	Green	2.84702	1.26986	3.92363	1.20252	0.99	0.0666	236
	Dry	<b>1. 31287</b>	1.27472	1.68638	1.22252	0.99	0.0720	236
<b>Sycamore</b>	Green	<b>3. 85492</b>	1.21745	3.47106	1.73933	<b>0. 98</b>	<b>0. 0889</b>	29
	Dry	1.80787	1.20679	1.52656	1.24206	<b>0. 98</b>	0.0887	29
<b>Yellow-poplar</b>	Green	<b>4. 16189</b>	1.18760	4.74211	1.16039	0.98	0.0602	78
	Dry	<b>1. 83937</b>	1.21873	2.61846	1.14509	0.98	0.0594	78
<b>Hat-d Hardwoods</b>	Green	<b>3. 26545</b>	1.25704	7.84482	1.07428	0.99	0.0787	338
	Dry	<b>1. 84449</b>	1.27009	6.03182	1.02303	0.99	0.0816	338
<b>Elm species</b>	Green	<b>2. 50952</b>	1.38580	-	-	0.99	0.1114	16
	Dry	<b>1. 63763</b>	1.21880	-	-	0.98	0.1575	16
<b>Hickory species</b>	Green	3.21191	1.22618	2.06379	1.31841	0.99	0.0683	22
	Dry	1.97528	1.23186	1.72985	1.25953	0.99	0.0708	22
<b>Chestnut oak</b>	Green	2.91108	1.25815	-	-	0.99	0.0918	37
	Dry	1.74635	1.264132	-	-	0.99	0.0904	37
<b>Scarlet oak</b>	Green	7.30927	1.06838	7.07711	1.07511	0.99	0.0430	32
	Dry	4.55975	1.04716	4.96382	1.02946	0.99	0.0402	32
<b>South. red oak</b>	Green	3.42543	1.24413	8.29811	1.05964	0.98	<b>0. 0769</b>	48
	Dry	1.96985	1.24888	5.74409	1.02572	<b>0. 98</b>	<b>0. 0789</b>	48
<b>White oak</b>	Green	3.94053	1.20929	4.92392	1.16284	0.99	<b>0. 0629</b>	110
	Dry	2.33238	1.21371	3.62486	1.12177	0.99	0.0652	110

Continued

**Table 8.** --Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued

Species or species group	Weight green or dry	Regression equation coefficients				Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled
		Trees < 11.0 in d.b.h.	-	Trees > 11.0 in d.b.h.	b			
All Species	Green	3.05596	1.26193	5.72003	1.13122	0.99	0.0789	773
	Dry	1.63740	1.26316	3.40599	1.11043	0.98	0.0992	773
TOTAL-STEM WOOD								
Soft Hardwoods	Green	2.29553	1.28964	3.93834	1.17708	0.99	0.0803	435
	Dry	1.19533	1.27529	1.93202	1.17527	0.99	U.0882	435
Red maple	Green	2.71814	1.24661	37.16936	0.70123	0.99	0.0847	32
	Dry	1.54154	1.24764	11.01055	U.83768	0.99	U.0859	32
Sweetgum	Green	2.23375	1.29553	3.17921	1.22194	0.99	0.0699	236
	Dry	1.06049	1.29157	1.38257	1.23627	0.99	0.0749	236
Sycamore	Green	3.57651	1.22324	3.15518	1.24938	0.98	0.0900	29
	Dry	1.67801	1.21177	1.42020	1.24655	0.98	0.0897	29
Yellow-poplar	Green	2.92832	1.22727	3.88793	1.16817	0.98	0.0598	78
	Dry	1.34294	1.25372	2.28931	1.14251)	0.98	0.0602	78
Hard Hardwoods	Green	2.55430	1.27648	5.93585	1.10065	0.99	0.0867	338
	Dry	1.50661	1.27832	4.62594	1.04441	0.99	0.0884	338
Elm species	Green	1.99983	1.31513	-	-	0.99	0.1116	16
	Dry	1.35944	1.23738	-	-	0.98	0.1588	16
Hickory species	Green	2.16113	1.25706	0.99368	1.41907	0.99	0.0698	22
	Dry	1.34563	1.26652	0.95566	1.33788	0.99	0.0740	22
Chestnut oak	Green	2.10341	1.28826	-	-	0.98	0.1018	37
	Dry	1.31709	1.28164	-	-	0.98	0.1036	37
Scarlet oak	Green	5.86508	1.08429	5.87333	1.08399	0.99	0.0440	32
	Dry	3.77556	1.05401	4.34532	1.05401	0.99	0.0407	32
South. red oak	Green	2.47712	1.27276	6.05373	1.08643	0.98	0.0785	48
	Dry	1.48494	1.26384	4.35351	1.03956	0.98	0.0797	48

Continued

**Table 8.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable--Continued**

<b>Species or species group</b>	<b>Weight green or dry</b>	<b>Regression equation coefficients</b>				<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S<sub>y,x</sub>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>	<b>Trees ≥ 11.0 in d.b.h.<sup>2</sup></b>	<b>a'</b>	<b>b</b>	<b>a''</b>	<b>b</b>	
<b>White oak</b>	<b>Green</b>	<b>2. 83704</b>	<b>1. 25375</b>			<b>4. 14649</b>	<b>1. 17462</b>	<b>0. 99</b>
	Dry	1.77828	1.24515			3.07673	1.13084	0.99
<b>All Species</b>	<b>Green</b>	<b>2. 41288</b>	<b>1. 28299</b>			<b>4. 63505</b>	<b>1. 14686</b>	<b>0. 99</b>
	Dry	<b>1. 33502</b>	<b>1. 27564</b>			<b>2. 78765</b>	<b>1. 12212</b>	<b>0. 98</b>

**<sup>1</sup>Trees < 11.0 inches d.b.h.**

$$Y = a'(D^2)^b$$

**<sup>2</sup>Trees ≥ 11.0 inches d.b.h.**

$$Y = a''(D^2)^b$$

**Where:** **Y** = component weight in pounds

**D** = tree d.b.h. in inches

**a'**, **a''**, **b** = regression coefficients

**<sup>3</sup>log<sub>10</sub> form**

**Table 9. --Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont using d.b.h. as the independent variable**

Species or species group	Volume wood & Trees or wood only	Regression equation		Coefficients		Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		<11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b			
TOTAL TREE								
<b>Soft Hardwoods</b>	Wd&Bk	0.06133	1.24731	0.116577	1.23275	0.99	0.0761	<b>435</b>
	<b>Wood</b>	<b>0.04528</b>	<b>1.27576</b>	<b>0.05456</b>	<b>1.23689</b>	<b>0.99</b>	<b>0.0796</b>	<b>435</b>
<b>Red maple</b>	Wd&Bk	0.08902	1.16798	0.15339	<b>1.04783</b>	0.99	0.0545	<b>32</b>
	Wood	0.06925	<b>1.19637</b>	0.18274	0.99405	0.99	0.0542	<b>32</b>
Sweetgum	Wd&Bk	0.05777	1.25093	0.05074	1.27799		0.0644	<b>236</b>
	Wood	0.04174	1.28099	0.03627	<b>1.31030</b>		0.0678	<b>236</b>
<b>Sycamore</b>	Wd&Bk	0.04866	1.31311	0.11283	<b>1.13773</b>		0.0868	<b>29</b>
	Wood	0.04437	<b>1.32068</b>	0.10270	<b>1.14566</b>		0.0887	29
<b>Yellow poplar</b>	Wd&Bk	0.09562	1.15688	0.06793	<b>1.22818</b>	0.98	0.0590	<b>78</b>
	Wood	0.06617	1.19490	0.06550	<b>1.19703</b>	0.99	0.0551	<b>78</b>
<b>Hard Hardwoods</b>		0.06449	1.25435	0.07088	<b>1.23465</b>	0.99	0.0784	<b>338</b>
	Wood	0.04778	1.27429	0.05221)	1.25584	0.99	0.0830	<b>338</b>
<b>Elm species</b>		0.05579	1.30112		-	0.99	0.1107	<b>16</b>
		0.03880	1.34482		-	0.99	0.1045	<b>16</b>
<b>Hickory species</b>	Wd&Bk	0.06089	1.27111	0.05047	1.31025	<b>0.99</b>	0.0802	<b>22</b>
	Wood	0.04188	1.28532	0.02587	<b>1.38625</b>	0.99	0.0695	<b>22</b>
Chestnut oak	Wd&Bk	0.05722	1.26048		-	0.99	0.0842	<b>37</b>
	<b>Wood</b>	<b>0.04025</b>	<b>1.28301</b>		-	0.99	0.0921	<b>37</b>
<b>Scarlet oak</b>	Wd&Bk	0.10028	1.15114	0.07664	<b>1.20721</b>	0.99	0.0475	<b>32</b>
	<b>Wood</b>	<b>0.07922</b>	<b>1.16019</b>	<b>0.05809</b>	<b>1.22490</b>	0.99	0.0461	<b>32</b>
South. red oak	Wd&Bk	0.06334	1.23586	0.04628	1.30129	0.99	0.0637	<b>48</b>
	<b>Wood</b>	<b>0.04568</b>	<b>1.25697</b>	<b>0.03162</b>	<b>1.33367</b>	0.99	0.0649	<b>48</b>

‡

**Table 9.--Regression equations **for estimating cubic-foot** volume **of above-stump total-tree wood and bark** combined and wood alone **for** hardwood **species in the** Piedmont, with d.b.h. **as the** independent **variable--Continued****

Species or species group	Volume wood & <b>bark</b> <b>Trees &lt; 11.0 inches d.b.h.</b> or <b>wood only</b>	Regression equation coefficients				<b>Coefficient</b> of determination (R <sup>2</sup> )	<b>Standard</b> <b>error</b> <sup>3</sup> (S <sub>y,x</sub> )	<b>No. of</b> <b>trees</b> <b>sampled</b>
		a'	b	a''	b			
<b>White oak</b>	Wd&Bk	<b>0. 06322</b>	<b>1. 25707</b>	<b>0. 06375</b>	<b>1. 25535</b>	0.99	0.0609	<b>110</b>
	Wood	<b>II. 04497</b>	<b>1. 28857</b>	0.04809	<b>1. 37461)</b>	0.99	0.0606	<b>110</b>
<b>All Species</b>	Wd&Bk	0.06272	1.25045	0.06812	<b>1. 73323</b>	<b>0. 93</b>	0.0787	<b>773</b>
	<b>Wood</b>	0.04639	1.27498	0.05360	1.24488	0.99	<b>0. 0817</b>	<b>773</b>

<sup>1</sup>Trees < **11.0 inches** d.b.h.

$$Y = a' (D^2)^b$$

"**Trees > 11.0 inches** d.b.h.:

$$Y = a'' (D^2)^b$$

Where: **Y= component volume in cubic feet**

**D = tree d.b.h. in inches**

**a', a'', b = regression coefficients**

<sup>3</sup>log<sub>10</sub> form

Table 10. --Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

Species or species group	Volume wood & bark only	Regression equation coefficients				Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	b	Trees > 11.0 in d.b.h. <sup>2</sup>	b			
o	o	d	a'	b	a''	b		
<b>TOTAL STEM</b>								
<b>Soft Hardwoods</b>	Wd&Bk	0.05122	1.35830	<b>0. 09012</b>	1.14049	0.99	<b>0. 0758</b>	<b>435</b>
	<b>Wbod</b>	0.03847	1.28688	<b>U. 97226</b>	1.15544	<b>0. 99</b>	0.0780	<b>435</b>
<b>Red maple</b>	Wd&Bk	0.06336	1.71217	<b>0. 66306</b>	<b>0. 72257</b>	<b>0. 99</b>	<b>0. 0684</b>	32
	<b>wood</b>	0.05114	1.23716	<b>0. 65278</b>	<b>(1. 70613</b>	<b>0. 99</b>	0.0673	<b>32</b>
Sweetgum	Wd&Bk	0.04986	1.26029	<b>0. 08756</b>	<b>1. 14285</b>		<b>0. 0662</b>	<b>236</b>
	<b>Wbod</b>	0.03652	1.29093	<b>0. 05882</b>	<b>1. 19153</b>	0.99	<b>0. 0682</b>	<b>236</b>
<b>Sycamore</b>	Wd&Bk	0.05459	1.24104	0.07330	<b>1. 17957</b>		<b>0. 0852</b>	<b>29</b>
	<b>wood</b>	0.05013	1.24991	<b>0. 06810</b>	<b>1. 18604</b>	0.99	0.0858	<b>29</b>
<b>Yellow-poplar</b>	Wd&Bk	0.08183	1.16608	0.08798	<b>1. 50960</b>	<b>0. 98</b>	<b>0. 0648</b>	78
	<b>Wbod</b>	0.06001	1.19469	<b>0. 07990</b>	<b>1. 13499</b>	<b>0. 98</b>	<b>0. 0598</b>	<b>78</b>
<b>Hard Hardwoods</b>	Wd&Bk	0.05376	1.24627	<b>0. 14796</b>	<b>1. 03514</b>	<b>0. 99</b>	<b>0. 0778</b>	<b>338</b>
	<b>Wood</b>	0.04021	1.27213	<b>0. 10886</b>	<b>1. 06448</b>	<b>0. 99</b>	<b>0. 0823</b>	<b>338</b>
<b>Elm species</b>	Wd&Bk	0.04369	1.27843		-	<b>0. 99</b>	0.1099	16
	<b>wood</b>	0.03127	1.32648		-	<b>0. 99</b>	<b>0. 1081</b>	<b>16</b>
<b>Hickory species</b>	Wd&Bk	0.05484	1.22724	<b>0. 06012</b>	1.20805	<b>0. 99</b>	<b>0. 0646</b>	22
	<b>wood</b>	0.03771	1.25407	<b>0. 03115</b>	<b>1. 29395</b>	<b>0. 99</b>	<b>0. 0617</b>	<b>22</b>
<b>Chestnut oak</b>	Wd&Bk	0.04993	1.24922		-	0.99	<b>0. 0813</b>	37
	<b>Wbod</b>	0.03565	1.27559		-	<b>0. 99</b>	<b>0. 0894</b>	<b>37</b>
<b>Scarlet oak</b>	Wd&Bk	0.10646	1.07358	0.10101	<b>1. 08455</b>	<b>0. 98</b>	0.0488	32
	<b>wood</b>	0.08287	1.09534	0.084213	<b>1. 09203</b>	<b>0. 98</b>	<b>0. 0488</b>	<b>32</b>
<b>South. red oak</b>	Wd&Bk	0.05764	1.21902	0.10204	<b>1. 09994</b>	<b>0. 98</b>	<b>0. 0741</b>	<b>48</b>
	<b>Wbod</b>	0.04290	1.23743	0.06547	<b>1. 14927</b>	<b>0. 98</b>	0.0720	<b>48</b>

Table 10.--Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. as the independent variable

Species or species group	Volume wood & bark or wood only	Regression equation coefficients				Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b	a"	b	
<b>White oak</b>	Wd&Bk	<b>0. 07001</b>	<b>1. 17560</b>	<b>0. 08321</b>	<b>1. 13957</b>	<b>0. 99</b>	<b>0. 0620</b>	110
	Wood	0.04919	1.21908	0.06392	1.16447	0.99	0.0637	110
All Species	Wd&Bk	<b>0. 05245</b>	<b>1. 25226</b>	<b>0. 10979</b>	<b>1. 09820</b>	<b>0. 99</b>	<b>0. 0771</b>	773
	Wbd	<b>0. 03933</b>	<b>1. 27963</b>	<b>0. 08489</b>	<b>1. 11920</b>	<b>0. 99</b>	<b>0. 0804</b>	773

<sup>1</sup>Trees < 11.0 inches d.b.h.

$$Y = a'(D^2)^b$$

<sup>2</sup>Trees > 11.0 inches d.b.h.

$$Y = a''(D^2)^b$$

Where: Y = component volume in cubic feet

D = tree d.b.h. in inches

a', a'', b = regression coefficients

<sup>3</sup>log<sub>10</sub> form

Table 11.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables

Species or Species group	Weight green or dry	Regression equation coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled			
		Trees < 11.0 in d.b.h.								
		a <sup>4</sup>	b	c						
<b>TOTAL-TREE WOOD, BARK, AND FOLIAGE</b>										
Soft Hardwoods	Green	0.26936	0.93662	0.11762	1.10939	0.93662	0.0624			
	Dry	0.13490	0.93309	0.05689	1.11312	0.93309	0.0793			
Red maple	Green	0.39183	0.89196	0.10150	1.17362	0.89196	0.0571			
	Dry	0.19766	0.90302	0.03697	1.25258	0.90302	0.0553			
Sweetgum	Green	0.25462	0.93830	0.07753	1.18624	0.93830	0.0572			
	Dry	0.11357	0.94351	0.03107	1.21380	0.94351	0.0609			
Sycamore	Green	0.13562	1.03417	0.35092	0.83594	1.03417	0.0623			
	Dry	0.06195	1.03171	0.15708	0.83771	1.03171	0.0580			
Yellow-poplar	Green	0.30167	0.92608	0.15034	1.07131	0.92608	0.0421			
	Dry	0.12309	0.94820	0.07267	1.05809	0.94820	0.0509			
Hard Hardwoods	Green	0.34177	0.93392	0.07063	1.26268	0.93392	0.0770			
	Dry	0.17321	0.95225	0.04598	1.22873	0.95225	0.0765			
Elm species	Green	0.28983	0.94981	-	-	0.99	0.0877			
	Dry	0.19128	0.91936	-	-	0.99	0.1304			
Hickory species	Green	0.32136	0.94256	0.07871	1.23589	0.94256	0.0784			
	Dry	0.18315	0.95030	0.05406	1.20474	0.95030	0.0677			
Chestnut oak	Green	0.20469	0.98361	-	-	0.99	0.0679			
	Dry	0.11665	0.99033	-	-	0.99	0.0668			
Scarlet oak	Green	0.34542	0.94737	0.10278	1.20014	0.94737	0.0696			
	Dry	0.21669	0.93708	0.06694	1.18201	0.93708	0.0732			
South. red oak	Green	0.30456	0.94228	0.10284	1.1686	0.94228	0.0457			
	Dry	0.16220	0.95348	0.06195	1.15418	0.95348	0.0476			

Continued

Table 11.--Regression **equations for** estimating **green and dry weight of** above-stump **total-tree wood, bark, and foliage, wood** and bark combined, **and wood alone for hardwood** species **in the** Piedmont, with d.b.h. and **total height as independent** variables--Continued

<b>Species or species group</b>	<b>Weight green or dry</b>	<b>Regression equation on coefficients</b>						<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S.<sub>y</sub>)<sub>x</sub></b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>		<b>Trees &gt; 11.0 in d.b.h.<sup>2</sup></b>		<b>a'</b>	<b>b</b>	<b>c</b>		
<b>White oak</b>	<b>Green</b>	0.24019	0.98258	0.113382	<b>1. 15748</b>	<b>0. 98258</b>	0.99	0.0526	110	
	Dry	<b>U. 13493</b>	<b>0. 98969</b>	0.06771	<b>1. 13346</b>	0.98969	0.99	0.0525	110	
<b>All Species</b>	<b>Green</b>	<b>0. 30645</b>	0.93307	0.09434	<b>1. 17874</b>	<b>0. 933137</b>	0.99	0.0864	773	
	Dry	<b>0. 15769</b>	0.Y3800	0.05216	<b>1. 16867</b>	0.93800	0.98	0.1197	773	
<b>TOTAL-TREE WOOD AND BARK</b>										
<b>Soft Hardwoods</b>	<b>Green</b>	0.24306	U.94449	U. 10946	1.11083	0.94449	0.99	0.0595	435	
	Dry	0.12693	0.93728	U.05332	1.11815	0.93728	0.99	0.0779	435	
<b>Red maple</b>	<b>Green</b>	U.32214	0.91052	0.11496	1.13538	0.91052	0.99	0.0541	32	
	Dry	0.17603	0.91317	0.04068	1.31861	U.91317	0.99	0.0534	32	
<b>Sweetgum</b>	<b>Green</b>	0.23205	0.94503	U.06999	1.19494	0.94503	0.99	0.0548	236	
	Dry	0.10800	0.94648	U.02818	1.22662	0.94648	0.99	0.0603	236	
<b>Sycamore</b>	<b>Green</b>	<b>0. 13774</b>	1.02804	0.34788	0.83485	1.02804	0.99	0.0587	29	
	Dry	0.06368	1.02573	U. 15849	0.83560	1.02573	0.99	0.0558	29	
<b>Yellow-poplar</b>	<b>Green</b>	<b>0. 26330</b>	0.93782	0.13885	1.07125	0.93782	0.99	0.0409	78	
	Dry	0.11509	U.95352	0.06855	1.06155	U.95352	0.99	0.0511	78	
<b>Hard Hardwoods</b>	<b>Green</b>	<b>0. 29779</b>	0.94543	0.06774	1.25419	0.94543	0.99	0.0731	338	
	Dry	<b>0. 16065</b>	0.05747	0.04467	1.22435	0.95747	0.99	0.0740	338	
<b>Elm species</b>	<b>Green</b>	0.25810	0.95874				0.99	0.0833	16	
	Dry	0.17690	0.02435				0.99	0.1272	16	
<b>Hickory species</b>	<b>Green</b>	0.28410	0.95141	0.07224	1.23694	U.95141	0.99	0.0747	22	
	Dry	0.16922	0.95583	0.05168	1.20316	0.95583	0.99	0.0659	22	
<b>Chestnut oak</b>	<b>Green</b>	0.19171	<b>0. 98587</b>				0.99	0.0667	37	
	Dry	0.11122	0.99205				0.99	0.0673	37	

Continued

**Table 11. --Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	b	a''	b	c			
<b>Scarlet oak</b>	Green	<b>0. 29820</b>	0.95918	<b>0. 09697</b>	<b>1. 19341</b>	0.95918	0.97	0.0623	32
	Dry	<b>0. 19339</b>	0.94580	<b>0. 06601</b>	<b>1. 16994</b>	0.94580	0.97	0.0668	32
<b>South. red oak</b>	Green	<b>0. 26488</b>	0.95457	<b>0. 10144</b>	<b>1. 15471</b>	0.95457	0.99	0.0442	48
	Dry	<b>0. 14786</b>	0.96117	<b>0. 06106</b>	<b>1. 14557</b>	0.96117	0.99	0.0462	48
<b>White oak</b>	Green	<b>0. 22734</b>	0.98415	<b>0. 09632</b>	<b>1. 16321</b>	0.98415	0.99	0.0510	110
	Dry	<b>0. 13069</b>	0.98979	<b>0. 06451</b>	<b>1. 13699</b>	0.98979	0.99	0.0509	110
<b>All Species</b>	Green	<b>0. 27176</b>	0.94274	<b>0. 08903</b>	<b>1. 17543</b>	0.94274		0.0827	773
	Dry	<b>0. 14724</b>	0.94275	<b>0. 04964</b>	<b>1. 16948</b>	0.94275		0.1171	773
<b>TOTAL-TREE WOOD</b>									
Soft Hardwoods	Green	0.17980	U.96177	<b>0. 08990</b>	1.10631	0.96177	0.99	0.0618	435
	Dry	<b>0. 09703</b>	0.95097	<b>0. 04511</b>	1.11065	0.95097	0.99	0.0796	435
<b>Red maple</b>	Green	<b>0. 23096</b>	0.93295	<b>0. 12402</b>	1.116261	0.93295	0.99	0.0536	32
	Dry	<b>0. 128118</b>	0.93549	0.03989	1.17871	0.93549	0.99	0.0534	32
<b>Sweetgum</b>	Green	0.16922	0.96425	0.05500	1.19861	0.96425	0.99	0.0541	236
	Dry	<b>0. 08213</b>	0.95995	<b>0. 02297</b>	1.22561	0.95995	0.99	0.0592	236
<b>Sycamore</b>	Green	<b>0. 12507</b>	1.03190	<b>0. 30789</b>	0.84406	1.03190	0.99	0.0603	29
	Dry	<b>0. 05797</b>	1.02895	<b>0. 14459</b>	0.83837	1.02895	0.99	0.0578	29
<b>Yellow-poplar</b>	Green	<b>0. 15548</b>	0.97611	<b>0. 10454</b>	1.05888	0.97611	0.99	0.0409	78
	Dry	<b>0. 07235</b>	0.98718	<b>0. 05550</b>	1.04247	0.98718	0.99	0.0551	78
Hard Hardwoods	Green	<b>0. 22486</b>	<b>0. 95562</b>	<b>0. 04892</b>	1.27369	0.95562	0.99	0.0796	338
	Dry	<b>0. 12984</b>	0.95964	<b>0. 03394</b>	1.23943	0.95964	0.99	0.0798	338
<b>Elm species</b>	Green	0.18592	0.98109				0.99	0.0798	16
	Dry	<b>0. 13407</b>	0.94042				0.99	0.1277	16

Table 11...Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>					
		a'	b	a''	b	c			
<b>Hickory species</b>	<b>Green</b>	<b>0. 18370</b>	<b>0. 96680</b>	0.03339	<b>1. 32235</b>	<b>0. 96680</b>	0.99	<b>0. 0658</b>	22
	<b>Dry</b>	<b>0. 11002</b>	0.97549	<b>0. 02756</b>	<b>1. 26413</b>	0.97549	0.99	<b>0. 0624</b>	22
<b>Chestnut oak</b>	<b>Green</b>	<b>0. 12608</b>	<b>1. 00846</b>	-	-	-	0.99	<b>0. 0678</b>	37
	<b>Dry</b>	<b>0. 07904</b>	<b>1. 00511</b>	-	-	-	0.99	<b>0. 0702</b>	37
<b>Scarlet oak</b>	<b>Green</b>	<b>0. 23667</b>	<b>0. 96469</b>	<b>0. 07307</b>	1.20974	<b>0. 96469</b>	0.98	<b>0. 0623</b>	32
	<b>Dry</b>	<b>0. 16244</b>	<b>0. 94389</b>	<b>0. 05354</b>	<b>1. 17531</b>	<b>0. 94389</b>	0.97	<b>0. 0679</b>	32
<b>South. red oak</b>	<b>Green</b>	<b>0. 17607</b>	<b>0. 97670</b>	<b>0. 07110</b>	<b>0. 16576</b>	<b>0. 97670</b>	0.99	<b>0. 0454</b>	48
	<b>Dry</b>	0. 10609	0.97270	<b>0. 04584</b>	<b>1. 14767</b>	0.97270	0.99	<b>0. 0484</b>	48
<b>White oak</b>	<b>Green</b>	0.15297	1.01011	0.07099	<b>1. 17020</b>	1.01011	0.99	<b>0. 0498</b>	110
	<b>Dry</b>	0.09539	1.00695	0.05039	<b>1. 14000</b>	1.00695	0.99	0.0494	110
<b>All Species</b>	<b>Green</b>	0.20242	0.95702	0.06917	1.18091	0.95702	0.99	0.0825	773
	<b>Dry</b>	0.11508	0.95131	0.03994	1.17198	0.95131	0.98	0.1144	773

'Trees < 11.0 inches d.b.h.

$$Y = a'(D^2 Th)^b$$

\*Trees > 11.0 inches d.b.h.

$$Y = a''(D^2)^b (Th)^c$$

Where:  $Y$  = component weight in pounds

$D$  = tree d.b.h. in inches

$Th$  = tree total height in feet

$a'$ ,  $a''$ ,  $b$ ,  $c$  = regression coefficients

$\log_{10}$  form

**Table 12 .--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables**

Species or species group	Weight green or dry	Regression equation coefficients						Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled			
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>		<b>Trees &gt; 11.0 in d.b.h.<sup>2</sup></b>		<b>a'</b>	<b>b</b>						
		<b>a"</b>	<b>b</b>	<b>c</b>									
<b>TOTAL-STEM WOOD AND BARK</b>													
Soft Hardwoods	<b>Green</b>	0.19535	0.95420	<b>11.13963</b>	1.02422	0.95420	0.99	0.0509	<b>435</b>				
	<b>Dry</b>	0.10185	0.94724	0.06873	1.02926	0.94724	0.99	0.0684	<b>435</b>				
<b>Red maple</b>	<b>Green</b>	0.21176	0.94169	<b>0.43801</b>	0.79014	<b>iJ.94169</b>	0.99	0.0533	<b>32</b>				
	<b>Dry</b>	0.11548	0.94569	<b>0.13444</b>	0.91400	<b>0.94569</b>	0.99	0.0576	<b>32</b>				
Sweetgum	<b>Green</b>	0.19644	0.95126	0.10744	1.07709	0.95126	0.99	0.0493	<b>236</b>				
	<b>Dry</b>	0.05995	0.95479	<b>0.04550</b>	1.09690	<b>11.95479</b>	0.99	0.0569	<b>236</b>				
<b>Sycamore</b>	<b>Green</b>	0.17930	0.97530	<b>0.25566</b>	0.90132	0.97530	0.99	0.0546	<b>29</b>				
	<b>Dry</b>	0.08576	0.96758	<b>0.11551</b>	0.90547	0.96758	0.99	0.0522	<b>29</b>				
<b>Yellow-poplar</b>	<b>Green</b>	0.21276	0.94890	<b>0.17525</b>	0.98934	0.94890	0.99	0.0374	<b>78</b>				
	<b>Dry</b>	0.09197	0.96733	0.08760	0.97748	0.96733	0.99	0.0469	<b>78</b>				
<b>Hard Hardwoods</b>	<b>Green</b>	0.24539	0.94286	0.14508	1.05244	0.94286	0.99	0.0571	<b>338</b>				
	<b>Dry</b>	0.13483	0.95272	0.10708	1.00078	0.95272	0.99	0.0601	<b>338</b>				
Elm species	<b>Green</b>	0.20468	0.94722	-	-	-	0.99	0.0803	<b>16</b>				
	<b>Dry</b>	0.15080	0.89866	-	-	-	U.98	0.1323	<b>16</b>				
Hickory species	<b>Green</b>	0.28068	0.91782	<b>0.08565</b>	1.16531	0.91782	0.99	0.0530	<b>22</b>				
	<b>Dry</b>	0.16939	0.92285	<b>0.07118</b>	1.10362	0.92285	0.99	0.0494	<b>22</b>				
Chestnut oak	<b>Green</b>	0.16876	0.97862	-	-	-	0.99	0.0560	<b>37</b>				
	<b>Dry</b>	0.10073	0.98236	-	-	-	0.99	0.0619	<b>37</b>				
Scarlet oak	<b>Green</b>	0.31737	0.92003	<b>0.17574</b>	1.04328	0.92003	0.99	0.0313	<b>32</b>				
	<b>Dry</b>	0.21155	0.90130	<b>0.13262</b>	0.99868	0.90130	0.99	0.0286	<b>32</b>				
South. red oak	<b>Green</b>	0.22863	0.95279	0.25013	0.93404	0.95279	0.99	0.0411	<b>48</b>				
	<b>Dry</b>	0.12912	0.95733	0.17157	<b>0.89806</b>	0.95733	0.99	0.0419	<b>48</b>				

**Table 12. --Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued**

<b>Species or species group</b>	<b>Weight green or dry</b>	<b>Regression equation coefficients</b>						<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S<sub>y,x</sub>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>		<b>Trees &gt; 11.0 in d.b.h.<sup>2</sup></b>						
		<b>a'</b>	<b>b</b>	<b>a''</b>	<b>b</b>	<b>c</b>				
<b>White oak</b>	<b>Green</b>	0.28438	0.92842	0.15775	1.05130	0.92842	0.99	0.0384	110	
	Dry	0.16565	11.93256	0.11510	1.00847	0.93256	0.99	0.0388	110	
<b>All Species</b>	<b>Green</b>	0.21945	0.94735	0.14017	1.04082	0.94735	0.9%	0.0621	773	
	Dry	0.11931	0.94646	0.08196	1.92475	0.94646	0.9%	0.0948	773	
<b>TOTAL-STEM WOOD</b>										
<b>Soft Hardwoods</b>	<b>Green</b>	U.14783	0.97129	0.11218	1.02882	0.97129	0.99	0.0537	435	
	Dry	U.08088	0.95972	U.05756	1.03064	0.95972	0.99	0.0701	435	
<b>Red maple</b>	<b>Green</b>	0.15758	0.06251	0.40998	0.76313	0.96251	0.99	0.0535	32	
	Dry	0.08935	0.96308	0.121167	U.90043	0.96308	0.99	0.0575	32	
<b>Sweetgum</b>	<b>Green</b>	0.14562	0.97102	U.08131	<b>1.09252</b>	0.97102	0.99	0.0491	236	
	Dry	0.06962	U.96819	0.03581	<b>1.10684</b>	0.96819	0.99	0.0551	236	
<b>Sycamore</b>	<b>Green</b>	0.16388	0.97998	0.22955	0.90971	0.97998	0.99	0.0560	29	
	Dry	0.07862	0.97153	0.10630	0.90864	0.97153	0.99	0.0537	29	
<b>Yellow-poplar</b>	<b>Green</b>	0.13679	U.97952	0.12839	0.99272	0.97952	0.99	0.0371	78	
	Dry	0.06279	0.99292	0.06915	0.97278	0.99292	0.99	0.0507	78	
<b>Hard Hardwoods</b>	<b>Green</b>	0.18378	0.95779	0.10349	<b>1.07753</b>	0.95779	0.99	0.0647	338	
	Dry	0.10787	U.95928	0.08026	<b>1.02094</b>	0.95928	0.99	0.0660	338	
<b>Elm species</b>	<b>Green</b>	0.15438	0.96864	-	-	-	0.99	0.0819	16	
	Dry	0.12080	0.91229	-	-	-	0.98	0.1338	16	
<b>Hickory species</b>	<b>Green</b>	0.17701	0.94126	0.03816	1.26121	0.94126	0.99	0.0512	22	
	Dry	0.10742	0.94905	0.03601	1.17696	0.94905	0.99	0.0504	22	
<b>Chestnut oak</b>	<b>Green</b>	0.11276	1.00300	-	-	-	0.99	0.0601	37	
	Dry	0.07167	0.99785	-	-	-	0.99	0.0635	37	

**Continued**

**Table 12. --Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled		
		Trees $\leq$ 11.0 in d.b.h. <sup>1</sup>	Trees $>$ 11.0 in d.b.h. <sup>2</sup>	a'	b	a"	b	c	
<b>Scarlet oak</b>	<b>Green</b>	<b>0.24677</b>	<b>0.93195</b>	<b>0.13788</b>	<b>1.05333</b>	<b>0.93195</b>	<b>0.99</b>	<b>0.0348</b>	<b>32</b>
	<b>Dry</b>	<b>0.17482</b>	<b>0.90509</b>	<b>0.11322</b>	<b>0.99567</b>	<b>0.90509</b>	<b>0.99</b>	<b>0.0323</b>	<b>32</b>
<b>South. red oak</b>	<b>Green</b>	<b>D. 15553</b>	<b>0.97454</b>	<b>0.16818</b>	<b>0.95824</b>	<b>0. g 7 1,4</b>	<b>0.99</b>	<b>0.0422</b>	<b>48</b>
	<b>Dry</b>	<b>0.09471</b>	<b>0.96816</b>	<b>0.12429</b>	<b>0.91149</b>	<b>0.96816</b>	<b>0.99</b>	<b>0.0439</b>	<b>48</b>
<b>White oak</b>	<b>Green</b>	0.18544	0.96281	0.11717	1.05853	0.96281	0.99	0.0418	110
	<b>Dry</b>	0.11755	0.95707	0.08949	1.01394	0.95707	0.99	0.0414	110
<b>All Species</b>	<b>Green</b>	0.16495	0.96370	0.10722	1.05352	0.96370	0.99	0.0642	773
	<b>Dry</b>	0.09425	0.95642	<b>0.06497</b>	1.03400	0.95642	0.99	0.0934	773

<sup>1</sup>Trees  $\leq$  11.0 inches d.b.h.

$$Y = a'(D^2 Th)^b$$

<sup>2</sup>Trees  $>$  11.0 inches d.b.h.

$$Y = a''(D^2)^b (Th)^c$$

Where: **Y** = component weight in pounds

**D** = tree d.b.h. in inches

**Th** = tree total height in feet

**a', a'', b, c** = regression coefficients

<sup>3</sup>log<sub>10</sub> form

**Table 13 .--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables**

<b>Species or species group</b>	<b>Volume wood &amp; bark or wood only</b>	<b>Regression equation coefficients</b>						<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S<sub>y,x</sub>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt; 11.0 in d.b.h.<sup>1</sup></b>		<b>Trees &gt; 11.0 in d.b.h.<sup>2</sup></b>		<b>a"</b>	<b>b</b>	<b>c</b>		
<b>TOTAL TREE</b>										
Soft Hardwoods	Wd&Bk	<b>0. 00441</b>	0.93725	<b>0. 00207</b>	1.09497	0.93725	0.99	0.0644	435	
	<b>Wbod</b>	0.00305	0.95911	<b>0. 00159</b>	1.09472	0.95911	0.99	0.0651	435	
<b>Red maple</b>	Wd&Bk	<b>0. 00640</b>	<b>0. 89829</b>	<b>0. 00222</b>	<b>1. 11877</b>	0.89829	0.99	0.0522	32	
	<b>Wbod</b>	0.00466	0.92037	<b>0. 00232</b>	<b>1. 06582</b>	0.92037	0.99	0.0492	32	
Sweetgum	Wd&Bk	0.00421	0.93574	<b>0. 00145</b>	<b>1. 15807</b>	0.93574	<b>0. 99</b>	0.0562	236	
	<b>Wbod</b>	0.00284	<b>0. 95883</b>	<b>0. 00096</b>	<b>1. 18585</b>	0.95883	<b>0. 99</b>	0.0558	236	
<b>Sycamore</b>	Wd&Bk	0.00181	1.04965	<b>0. 00669</b>	0.77750	1.04965	<b>0. 99</b>	0.0528	29	
	<b>Wbod</b>	0.00162	1.05601	<b>0. 00600</b>	0.78277	<b>1. 05601</b>	<b>0. 99</b>	0.0541	29	
<b>Yellow-poplar</b>	Wd&Bk	0.00536	<b>0. 92262</b>	<b>0. 00272</b>	1.06368	<b>0. 92262</b>	<b>0. 99</b>	0.0404	78	
	<b>Wbod</b>	0.00342	0.95142	<b>0. 00236</b>	1.02900	0.95142	<b>0. 99</b>	0.0360	78	
<b>Hard Hardwoods</b>	Wd&Bk	0.00495	0.93914	<b>0. 00130</b>	<b>1. 21748</b>	0.93914	<b>0. 99</b>	0.0690	338	
	<b>Wbod</b>	0.00350	0.95472	<b>0. 00091</b>	<b>1. 23664</b>	0.95472	<b>0. 99</b>	0.0698	335	
<b>Elm species</b>	Wd&Bk	0.00445	<b>0. 95789</b>		-	-	<b>0. 99</b>	0.0880	16	
	<b>Wbod</b>	0.00284	0.99024		-	-	0.99	0.0749	16	
<b>Hickory species</b>	Wd&Bk	0.00491	<b>0. 95048</b>	<b>0. 00185</b>	<b>1. 15410</b>	0.95048	<b>0. 99</b>	0.0731	22	
	<b>wood</b>	0.00327	0.96187	<b>0. 00092</b>	<b>1. 22727</b>	0.96187	<b>0. 99</b>	0.0578	22	
<b>Chestnut oak</b>	Wd&Bk	0.00338	0.97813		-	-	<b>0. 99</b>	0.0678	37	
	Wood	0.00223	0.99671		-	-	<b>0. 99</b>	0.0673	37	
<b>Scarlet oak</b>	Wd&Bk	0.00407	0.97092	<b>0. 00141</b>	<b>1. 19181</b>	0.97092	<b>0. 98</b>	0.0572	32	
	<b>Wbod</b>	0.00310	0.97972	0.00104	<b>1. 20829</b>	0.97972	<b>0. 98</b>	0.0551	32	
<b>South.red oak</b>	Wd&Bk	<b>0. 00466</b>	0.93718	<b>0. 00137</b>	1.19269	0.93718	<b>0. 99</b>	0.0445	48	
	<b>Wbod</b>	<b>0. 00320</b>	0.95379	<b>0. 00088</b>	1.23217	0.95379	<b>0. 99</b>	0.0438	48	

**Continued**

**Table 13. --Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued**

Species or species y r o u p	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>		a''	b	c		
		a'	b		a''	b	c			
<b>White oak</b>	Wd&Bk	<b>0. 011428</b>	<b>0. 96050</b>		<b>0. 00174</b>	<b>1. 14789</b>	<b>0. 96050</b>	<b>0. 99</b>	<b>0. 0512</b>	110
	Wood	0.00283	0.98528		0.00120	1.16313	3.98528	0.99	0.0478	110
<b>All Species</b>	Wd&Bk	0.00470	<b>0. 93676</b>		<b>0. 00170</b>	<b>1. 14888</b>	<b>0. 93676</b>	0.99	<b>0. 0741</b>	773
	Wood	<b>0. 00328</b>	<b>0. 95591</b>		<b>0. 00125</b>	<b>1. 15683</b>	<b>0. 95591</b>	0.99	<b>0. 0728</b>	773

<sup>1</sup>Trees < **11.0 inches d.b.h.**

$$Y = a'(D^2 Th)^b$$

<sup>2</sup>Trees >11.0 inches d.b.h.

$$Y = a''(D^2)^b(Th)^c$$

Where : **Y** = component volume in cubic feet

D = tree d.b.h. in inches

Th = tree total height in feet

**a', a'', b, c** = regression coefficients

<sup>3</sup>log<sub>10</sub> form

**Table 14. --Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. 1--		Trees > 11.0 in d.b.h. 2		a'	b	c		
<b>TOTAL STEM</b>										
<b>Soft Hardwoods</b>	Wd&Bk	<b>0.00355</b>	0.94695	<b>0.011278</b>	0.99773	0.94695	0.99	<b>0.0542</b>	<b>435</b>	
	Wbod	0.00250	<b>0.96882</b>	0.00207	<b>1.00852</b>	0.96882	<b>0.99</b>	<b>0.0534</b>	<b>435</b>	
<b>Red maple</b>	Wd&Bk	0.00402	0.93484	0.00817	<b>0.78674</b>	0.93484	<b>0.99</b>	<b>0.0417</b>	<b>32</b>	
	Wbod	<b>0.00307</b>	0.95401	<b>0.00734</b>	<b>0.77199</b>	<b>0.95401</b>	<b>0.99</b>	<b>0.0396</b>	<b>32</b>	
<b>Sweetgum</b>	Wd&Bk	<b>0.00354</b>	<b>0.94353</b>	<b>0.00245</b>	<b>1.01987</b>	0.94353	<b>0.99</b>	<b>0.0530</b>	<b>236</b>	
	Wbod	<b>0.00242</b>	0.96703	0.00152	<b>1.06405</b>	<b>0.96703</b>	<b>U.99</b>	<b>0.0509</b>	<b>236</b>	
<b>Sycamore</b>	Wd&Bk	<b>0.1~0240</b>	0.99364	0.00512	<b>0.83607</b>	0.99364	<b>0.99</b>	<b>0.0487</b>	<b>29</b>	
	Wbod	<b>0.00216</b>	1.00062	<b>0.00466</b>	<b>0.84031</b>	1.00062	<b>0.99</b>	<b>0.0495</b>	<b>29</b>	
<b>Yellow poplar</b>	Wd&Bk	0.00430	0.93475	0.00347	0.97925	0.93475	<b>0.99</b>	<b>0.0400</b>	<b>78</b>	
	Wood	<b>0.00298</b>	<b>0.95568</b>	<b>0.00290</b>	<b>0.96153</b>	0.95568	<b>0.99</b>	<b>0.0340</b>	<b>78</b>	
<b>Hard Hardwoods</b>	Wd&Bk	<b>0.00412</b>	0.93494	0.00284	<b>1.01304</b>	0.93494	<b>0.99</b>	<b>0.0551</b>	<b>338</b>	
	wood	0.00291	<b>0.95482</b>	0.00193	<b>1.041362</b>	0.95482	<b>0.99</b>	<b>0.0564</b>	<b>338</b>	
<b>Elm species</b>	Wd&Bk	<b>0.09362</b>	<b>0.94165</b>	-	-	-	<b>0.99</b>	<b>0.0809</b>	<b>16</b>	
	Wood	<b>0.00236</b>	0.97704	-	-	-	<b>0.99</b>	<b>0.0757</b>	<b>16</b>	
<b>Hickory species</b>	Wd&Bk	<b>0.00481</b>	11.91795	<b>0.00248</b>	<b>1.05655</b>	0.91795	<b>0.99</b>	<b>0.0539</b>	<b>22</b>	
	wood	<b>0.00313</b>	0.93829	0.00120	<b>1.13843</b>	0.93829	<b>0.99</b>	<b>0.0472</b>	<b>22</b>	
<b>Chestnut oak</b>	Wd&Bk	0.00301	0.96996	-	-	-	<b>U.99</b>	<b>0.0588</b>	<b>37</b>	
	Wood	<b>0.00200</b>	<b>0.99149</b>	-	-	-	<b>0.99</b>	<b>0.0584</b>	<b>37</b>	
<b>Scarlet oak</b>	Wd&Bk	<b>0.00437</b>	<b>0.92917</b>	<b>0.00247</b>	<b>1.04824</b>	0.92917	<b>0.99</b>	<b>0.0327</b>	<b>32</b>	
	wood	<b>0.00323</b>	<b>0.94668</b>	0.00191	<b>1.05621</b>	0.94668	<b>0.99</b>	<b>0.0337</b>	<b>32</b>	
<b>South. red oak</b>	Wd&Bk	0.00409	0.93293	<b>0.00329</b>	0.97797	0.93293	0.99	<b>0.0398</b>	<b>48</b>	
	Wood	0.00294	<b>0.94612</b>	<b>0.00200</b>	<b>1.02702</b>	<b>0.94612</b>	<b>0.99</b>	<b>0.0368</b>	<b>48</b>	

Continued

**Table 14. -- Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and total height as independent variables--Continued**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients				Coefficient of determination (R <sup>2</sup> )	Standard error' (S <sub>y,x</sub> )	No. of trees sampled	
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b	a"	b	c	
<b>White oak</b>	Wd&Bk	<b>0. 00544</b>	<b>0. 90256</b>	0.00293	<b>1. 03114</b>	<b>0. 90256</b>	<b>0. 99</b>	<b>0. 0387</b>	110
	wood	<b>0. 00347</b>	<b>0. 93596</b>	<b>0. 00199</b>	<b>1. 05198</b>	<b>0. 93596</b>	0.99	0.0392	110
All Species	Wd&Bk	0.00382	0.94065	0.00278	1.00782	0.94065	0.99	0.0561	773
	wood	0.00269	0.96170	0.00199	1.02470	0.96170	0.09	0.0558	773

<sup>1</sup>Trees < 11.0 **inches** d.b.h.

$$Y = a' (D^2 Th)^b$$

<sup>2</sup>Trees > 11.0 inches d.b.h.

$$Y = a'' (D^2)^b (Th)^c$$

Where : Y = component volume **in cubic feet**

D = tree **d.b.h. in inches**

Th = tree **total height in feet**

a', a'', b, c = **regression coefficients**

<sup>3</sup>log<sub>10</sub> **form**

**Table 15. --Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables**

<b>Species or species group</b>	<b>Weight green or dry</b>	<b>Regression equation coefficients</b>						<b>Coefficient of determination (R<sup>2</sup>)</b>	<b>Standard error<sup>3</sup> (S<sub>y.x</sub>)</b>	<b>No. of trees sampled</b>
		<b>Trees &lt;11.0 in d.b.h.<sup>1</sup></b>		<b>Trees &gt;11.0 in d.b.h.<sup>2</sup></b>		<b>c</b>				
		<i>a'</i>	<i>b</i>	<i>a''</i>	<i>b</i>					
<b>TOTAL-TREE WOOD, BARK, AND FOLIAGE</b>										
<b>Soft Hardwoods</b>	<b>Green</b>	2.90893	<b>0. 69841</b>	<b>0. 39234</b>	<b>1. 11616</b>	<b>0. 69841</b>	<b>0. 99</b>	<b>0. 0538</b>	<b>327</b>	
	Dry	<b>1. 36096</b>	<b>0. 70330</b>	<b>0. 19732</b>	1.10597	0.70330	0.98	0.0690	<b>327</b>	
<b>Red maple</b>	<b>Green</b>	2.51894	<b>0. 71200</b>	<b>0. 19554</b>	1.24493	<b>0. 71200</b>	<b>0. 98</b>	<b>0. 0546</b>	<b>24</b>	
	Dry	<b>1. 35267</b>	<b>0. 71551</b>	<b>0. 06773</b>	<b>1. 33988</b>	<b>0. 71551</b>	<b>0. 98</b>	<b>0. 0559</b>	<b>24</b>	
<b>Sweetgum</b>	<b>Green</b>	<b>3. 15804</b>	0.68557	<b>0. 28003</b>	1.19077	<b>0. 68557</b>	<b>0. 99</b>	<b>0. 0514</b>	<b>175</b>	
	Dry	<b>1. 38655</b>	<b>0. 69333</b>	<b>0. 11550</b>	<b>1. 21156</b>	<b>0. 69333</b>	<b>0. 98</b>	<b>0. 0587</b>	<b>175</b>	
<b>Sycamore</b>	<b>Green</b>	<b>1. 32693</b>	0.80787	<b>0. 92610</b>	0.85286	0.80787	<b>0. 98</b>	<b>0. 0581</b>	<b>25</b>	
	Dry	0.61941	0.80286	<b>0. 40948</b>	0.88915	0.80286	<b>0. 98</b>	<b>0. 0614</b>	<b>25</b>	
<b>Yellow poplar</b>	<b>Green</b>	2.63970	<b>0. 70663</b>	<b>0. 38692</b>	<b>1. 10702</b>	0.70663	<b>0. 99</b>	<b>0. 0446</b>	<b>75</b>	
	Dry	1.09600	<b>0. 72761</b>	<b>0. 19264</b>	<b>1. 09014</b>	0.72761	<b>0. 99</b>	<b>0. 0496</b>	<b>75</b>	
<b>Hard Hardwoods</b>	<b>Green</b>	<b>2. 67031</b>	0.73383	<b>0. 22449</b>	<b>1. 25015</b>	<b>0. 73383</b>	<b>U. 98</b>	<b>0. 0711</b>	<b>264</b>	
	Dry	<b>1. 49934</b>	<b>0. 73995</b>	<b>0. 14185</b>	<b>1. 23164</b>	<b>0. 73995</b>	<b>0. 98</b>	<b>0. 0711</b>	<b>264</b>	
<b>Elm species</b>	<b>Green</b>	<b>2. 39030</b>	0.74495	-	-	-	'3. 97	<b>0. 0633</b>	<b>8</b>	
	Dry	<b>2. 53891</b>	0.65095	-	-	-	'3. 84	<b>0. 1347</b>	<b>8</b>	
<b>Hickory species</b>	<b>Green</b>	2.17151	0.76148	<b>0. 22393</b>	<b>1. 23520</b>	<b>0. 76148</b>	<b>0. 97</b>	<b>0. 0840</b>	<b>18</b>	
	Dry	1.52681	0.74343	<b>U. 14348</b>	<b>1. 23652</b>	<b>0. 74343</b>	<b>0. 97</b>	<b>0. 0797</b>	<b>18</b>	
<b>Chestnut oak</b>	<b>Green</b>	1.92030	0.76073	-	-	-	'3. 96	<b>0. 0686</b>	<b>25</b>	
	Dry	<b>1. 14467</b>	0.76155	-	-	-	<b>0. 97</b>	<b>0. 0637</b>	<b>25</b>	
<b>Scarlet oak</b>	<b>Green</b>	3.26248	<b>U. 72175</b>	<b>0. 26987</b>	<b>1. 24143</b>	0.72175	<b>il. 96</b>	<b>0. 0783</b>	<b>32</b>	
	Dry	2.02272	<b>0. 71235</b>	<b>U. 17335</b>	<b>1. 22465</b>	0.71235	<b>Cl. 95</b>	<b>0. 0825</b>	<b>32</b>	
<b>South. red oak</b>	<b>Green</b>	4.08240	0.67268	<b>11. 24070</b>	1.26297	0.67268	<b>0. 98</b>	<b>0. 0608</b>	<b>46</b>	
	Dry	2.13886	0.68665	<b>0. 15024</b>	<b>1. 24042</b>	0.68665	<b>0. 99</b>	<b>0. 0603</b>	<b>46</b>	

*Continued*

**Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients					Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>					
		a'	b	a''	b	c			
<b>White oak</b>	Green	<b>1. 95422</b>	0.77781	<b>0. 29380</b>	<b>1. 17291</b>	0.77781	0.99	0.0519	94
	Dry	<b>1. 15404</b>	0.77896	<b>0. 19005</b>	<b>1. 15507</b>	0.77896	u.99	0.0515	94
<b>All Species</b>	Green	2.98907	<b>0. 70662</b>	0.31019	1.17903	0.70662	(J.97	0.0795	591
	Dry	1.61049	0.70631	0.17278	1.17178	<b>0. 70631</b>	u.94	0.1145	591
<b>TOTAL-TREE WOOD AND BARK</b>									
Soft Hardwoods	Green	2.61299	0.70726	0.36877	1.11555	0.70726	0.99	0.0532	327
	Dry	1.26350	0.70948	0.18696	1.10790	0.70948	U.98	0.0691	327
Red maple	Green	2.30326	0.71766	0.20565	1.22141	<b>U. 71766</b>	0.98	0.0504	24
	Dry	<b>1. 26326</b>	<b>U. 71999</b>	0.07217	1.31686	<b>0. 71999</b>	0.98	0.0540	24
Sweetgum	Green	2.79700	0.69641	0.26066	1.19124	0.69641	0.99	0.0521	175
	Dry	1.26765	0.70156	0.10813	1.21483	0.70156	0.98	0.0596	175
Sycamore	Green	1.40524	0.79610	0.88179	<b>0. 89326</b>	0.79610	0.98	0.0565	25
	Dry	0.65686	0.79263	0.40134	0.89536	0.79263	0.98	0.0605	25
Yellow-poplar	Green	2.34770	0.71667	0.36267	1.10611	0.71667	u.99	0.0440	75
	Dry	1.03606	0.73186	0.18283	1.09355	0.73186	0.99	0.0503	75
Hard Hardwoods	Green	2.38269	0.74303	0.21752	1.24215	0.74303	0.98	0.0676	264
	Dry	1.38345	0.74616	rJ.13961	<b>1. 22438</b>	0.74616	0.98	0.0683	264
<b>Elm species</b>	Green	<b>2. 31863</b>	0.74394	-	-	-	0.97	0.0623	8
	Dry	2.55494	0.64640	-	-	-	U.83	0.1372	8
Hickory species	Green	2.29392	0.74850	<b>cl. 19491</b>	<b>1. 26259</b>	0.74850	0.97	0.0821	18
	Dry	1.57814	0.73516	<b>0. 13234</b>	<b>1. 25199</b>	0.73516	0.97	0.0788	18
<b>Chestnut oak</b>	Green	1.76370	0.76580	-	-	-	0.97	0.0664	25
	Dry	<b>1. 07594</b>	<b>0. 76527</b>	-	-	-	U.97	0.0623	25

**Table 15.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species** in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled			
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>		b	c						
		a'	b	a''	b								
<b>Scarlet oak</b>	Green	2.87006	0.73186	U. 25836	1.23392	0.73186	0.97	0.0711	3%	32			
	Dry	1.82832	0.71997	0.17283	1.21183	0.71997	U.96	0.0762	32				
<b>South. red oak</b>	Green	3.53643	0.68629	0.24601	1.24209	0.68629	<b>0.99</b>	0.057%	46	46			
	Dry	1.94108	0.69542	0.15151	1.22721	0.69542	<b>0.99</b>	0.0583	46				
<b>White oak</b>	Green	1.89162	0.77657	U.27041	1.18219	0.77657	<b>11.99</b>	0.0501	94	94			
	Dry	1.13847	U.77668	0.17921	1.16220	0.77668	<b>U.99</b>	0.0502	94				
All Species	Green	2.67371	0.71577	0.29531	1.17513	0.71577	<b>0.97</b>	0.0772	591	591			
	Dry	1.48730	0.71273	0.16628	1.16959	0.71273	<b>0.94</b>	0.1126	591				
TOTAL-TREE HOOD													
<b>Soft Hardwoods</b>	Green	1.99542	0.72157	0.30841	1.11091	0.72157	<b>0.98</b>	0.0576	327	327			
	Dry	0.99364	0.72040	0.16015	1.10099	0.72040	0.97	0.0723	327				
<b>Red maple</b>	Green	1.88383	0.72444	0.20926	1.18265	U.72444	<b>0.98</b>	0.0473	24	24			
	Dry	1.03086	0.72875	0.06680	1.29935	0.72375	<b>3.98</b>	0.0530	24				
<b>Sweetgum</b>	Green	2.08952	0.71391	0.21264	1.190'39	0.71391	<b>0.99</b>	0.0524	175	175			
	Dry	0.98670	0.71310	0.09031	1.21169	0.71310	<b>0.98</b>	0.0610	175				
<b>Sycamore</b>	Green	1.15994	0.81175	0.80826	U.88711	0.81178	<b>0.98</b>	0.0575	25	25			
	Dry	0.54228	0.80795	0.37989	0.88216	0.80795	<b>0.98</b>	0.0611	25				
<b>Yellow-poplar</b>	Green	1.68845	0.73275	0.27766	1.10916	0.73275	<b>0.99</b>	0.0441	75	75			
	Dry	0.79714	0.74243	U.14921	1.09183	0.74243	<b>0.98</b>	0.0530	75				
<b>Hard Hardwoods</b>	Green	1.74483	0.75788	0.16471	1.25002	0.75788	<b>0.98</b>	0.0720	264	264			
	Dry	1.02838	0.75937	0.11252	1.22074	0.75937	<b>0.97</b>	0.0736	264				
<b>Elm species</b>	Green	1.73930	0.76245	-	-	-	<b>0.98</b>	0.0508	8	8			
	Dry	2.19806	0.64650	-	-	-	<b>0.84</b>	0.1331	8				

Continued

**Table 15. --Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and height to a 4-inch top as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>		b	c			
		a'	b	a''	b	c				
<b>Hickory species</b>	Green	<b>1. 39474</b>	<b>0. 77236</b>	<b>0. 09270</b>	<b>1. 33767</b>	<b>0. 77236</b>	<b>0. 98</b>	<b>0. 0768</b>	<b>18</b>	18
	Dry	<b>0. 91832</b>	<b>0. 76974</b>	<b>0. 07464</b>	1.29310	0.76974	0.97	0.0779	18	
<b>Chestnut oak</b>	Green	<b>1. 32870</b>	<b>0. 77192</b>				<b>0. 96</b>	<b>0. 0703</b>	<b>25</b>	25
	Dry	<b>0. 84404</b>	<b>0. 76625</b>				<b>0. 96</b>	<b>0. 0707</b>	<b>25</b>	
<b>Scarlet oak</b>	Green	<b>2. 30200</b>	<b>0. 73638</b>	<b>0. 19592</b>	<b>1. 25017</b>	<b>0. 73638</b>	<b>0. 97</b>	<b>0. 0709</b>	<b>32</b>	32
	Dry	<b>1. 53103</b>	<b>0. 71834</b>	<b>0. 13986</b>	<b>1. 21733</b>	<b>0. 71834</b>	<b>0. 96</b>	<b>0. 0773</b>	<b>32</b>	
<b>South. red oak</b>	Green	2.52502	0.70064	0.17384	1.25859	0.70064	0.99	0.0592	46	46
	Dry	1.47845	0.69999	0.11256	1.23698	0.69999	0.99	0.0606	46	
<b>White oak</b>	Green	1.40995	0.79088	0.19790	1.20032	0.79088	0.99	0.0489	94	94
	Dry	0.89393	0.78533	0.13813	1.17472	0.78533	0.99	0.0486	94	
<b>All Species</b>	Green	1.98507	0.73131	0.23687	1.17460	0.73131	0.97	0.0768	591	591
	Dry	1.12708	0.72574	0.13862	1.16272	0.72574	0.94	0.1090	591	

<sup>1</sup>Trees < 11.0 inches d.b.h.

$$Y = a' (D^2 H4)^b$$

<sup>2</sup>Trees > 11.0 inches d.b.h.

$$Y = a'' (D^2)^b (H4)^c$$

Where: Y = component weight in pounds

D = tree d.b.h. in inches

H4 = tree height to 4-inch top in feet

a', a'', b, c = regression coefficients

<sup>3</sup>log<sub>10</sub> form

**Table 16 . . . Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables**

Species or species group	Weight green or dry	Regression equation coefficients						Coefficient of determination ( $R^2$ )	Standard error <sup>3</sup> ( $S_{y,x}$ )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>		Trees > 11.0 in d.b.h. <sup>2</sup>						
		a'	b	a''	b	c				
<b>TOTAL-STEM WOOD AND BARK</b>										
<b>Soft Hardwoods</b>	<b>Green</b>	2.29156	0.70545	0.42879	1.05493	0.70545	0.99	0.0465	327	
	Dry	1.12653	II. 70556	0.21669	1.04929	0.70556	<b>0.98</b>	0.0613	327	
<b>Red maple</b>	<b>Green</b>	2.23532	0.69908	0.53744	0.99535	<b>0.69908</b>	0.99	0.0322	24	
	Dry	1.22695	<b>0.70207</b>	0.16335	<b>1.12252</b>	0.70207	<b>0.98</b>	0.0493	24	
Sweetgum	<b>Green</b>	<b>2.50069</b>	0.69517	0.36891	1.09422	0.69517	0.99	0.0494	175	
	Dry	1.13379	0.70024	0.15884	1.11005	<b>0.70024</b>	0.98	0.0575	175	
<b>Sycamore</b>	<b>Green</b>	1.57648	0.75799	0.59202	0.96221	0.75799	0.99	0.0517	25	
	Dry	0.76574	0.74827	0.26378	0.97049	0.74827	0.98	0.0573	25	
<b>Yellow-poplar</b>	<b>Green</b>	1.82487	0.73310	0.47036	0.47036	0.73310	0.99	0.0415	75	
	Dry	0.80991	0.74909	0.24003	1.00267	0.74909	0.99	0.0465	75	
<b>Hard Hardwoods</b>	<b>Green</b>	2.16281	0.72694	0.41701	1.07017	<b>0.72694</b>	0.99	0.0483	264	
	Dry	1.26025	0.72959	0.30008	1.02881	0.72959	0.99	0.0498	264	
<b>Elm species</b>	<b>Green</b>	<b>2.12287</b>	0.71366	-	-	-	0.99	0.0140	8	
	Dry	<b>3.05884</b>	0.57354	-	-	-	0.83	0.1255	8	
<b>Hickory species</b>	<b>Green</b>	2.69454	<b>0.69078</b>	0.20666	1.22623	0.69078	0.99	0.0470	18	
	Dry	1.86830	0.67878	0.16406	1.18601	0.67878	0.99	0.0497	18	
<b>Chestnut oak</b>	<b>Green</b>	1.86199	<b>0.73296</b>	-	-	-	0.98	0.0447	25	
	Dry	1.16418	0.73030	-	-	-	0.99	0.0421	25	
<b>Scarlet oak</b>	<b>Green</b>	2.59832	0.71047	0.45824	1.07229	0.71047	0.99	0.0323	32	
	Dry	1.68022	0.69448	0.33798	1.02888	0.69448	0.99	0.0326	32	
<b>South. red oak</b>	<b>Green</b>	2.89546	0.69112	0.62603	1.01046	0.69112	0.99	0.0504	46	
	Dry	1.60781	0.69805	0.43698	0.96970	0.69805	0.99	0.0498	46	

**Continued**

**Table 16. --Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued**

Species or species group	Height green or dry	Regression equation coefficients					Coefficient of determination ( $R^2$ )	Standard error' ( $S_{y,x}$ )	No. of trees sampled
		Trees $\leq 11.0$ in d.b.h. <sup>1</sup>	b	a''	b	c			
<b>White oak</b>	<b>Green</b>	<b>1.85973</b>	<b>U. 74792</b>	0.43602	<b>1.05037</b>	0.74792	0.99	0.0376	Y4
	Dry	1.13819	<b>0.74596</b>	<b>U. 31297</b>	<b>1.01517</b>	0.74596	0.99	0.0390	94
<b>All Species</b>	<b>Green</b>	2.30521	<b>0.71114</b>	<b>U. 42329</b>	<b>1.06454</b>	0.71114	0.98	0.0537	591
	Dry	1.28716	0.70695	<b>0.24850</b>	<b>1.04991</b>	0.70695	<b>0.96</b>	0.0864	591
<b>TOTAL STEM WOOD</b>									
<b>Soft Hardwoods</b>	Green	1.78632	0.71990	0.35353	1.05769	0.71990	<b>U. 99</b>	0.0503	327
	Dry	0.90284	(I. 71634)	0.18369	1.04836	0.71634	0.98	0.0634	327
<b>Red maple</b>	<b>Green</b>	1.80821	0.70999	0.49709	0.97925	0.70999	0.99	0.0294	24
	Dry	1.00466	0.71340	U.14684	1.11439	0.71340	0.98	0.0498	24
<b>Sweetgum</b>	<b>Green</b>	1.89662	<b>0.71354</b>	0.29324	<b>1.10281</b>	0.71354	0.99	0.0501	175
	Dry	0.89637	<b>U. 71212</b>	0.12940	1.11570	0.71212	0.98	0.0587	175
<b>Sycamore</b>	<b>Green</b>	<b>1.35267</b>	<b>0.77065</b>	0.54812	0.95907	0.77065	0.99	0.0520	25
	Dry	<b>0.65137</b>	<b>0.76164</b>	0.25165	0.95905	0.76164	0.98	0.0569	25
<b>Yellow poplar</b>	Green	1.37047	U.74627	0.34989	1.03095	0.74627	0.99	0.0416	75
	Dry	0.64459	0.75718	0.19106	1.01074	U.75718	0.99	0.0491	75
<b>Hard Hardwoods</b>	<b>Green</b>	1.59092	0.74533	0.31390	<b>1.08375</b>	0.74533	0.98	0.0563	264
	Dry	0.93691	U.74626	0.24016	1.03011	0.74626	0.98	0.0580	264
<b>Elm species</b>	<b>Green</b>	1.62361	0.73497				0.99	0.0262	8
	Dry	2.73257	0.57503				0.83	0.1251	8
<b>Hickory species</b>	<b>Green</b>	1.61589	0.72179	<b>0.09578</b>	<b>1.31097</b>	U.72179	0.99	0.0493	18
	Dry	<b>1.08255</b>	<b>0.71766</b>	0.08801	1.24095	0.71766	0.99	0.0524	18
<b>Chestnut oak</b>	<b>Green</b>	1.40117	U. 74325				0.98	0.0495	25
	Dry	0.90514	0.73521				0.98	0.0501	25

I. 11.

Table 16.--Regression equations for estimating green and dry weight of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued

Species or species group	Weight green or dry	Regression equation		coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error-3 (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b	a"	b	c	
<b>Scarlet oak</b>	Green	<b>2. 08324</b>	<b>0. 71926</b>	<b>0. 36368</b>	<b>1. 08321</b>	<b>0. 71926</b>	<b>0. 99</b>	<b>0. 0364</b>	32
	Dry	<b>1. 40851</b>	0.69671	<b>0. 28924</b>	<b>1. 02680</b>	<b>0. 69671</b>	<b>0. 99</b>	<b>0. 0370</b>	32
<b>South. red oak</b>	Green	<b>2. 15610</b>	<b>0. 70264</b>	<b>0. 41914</b>	<b>1. 04416</b>	<b>0. 713264</b>	<b>0. 99</b>	<b>0. 0520</b>	46
	Dry	<b>1. 26835</b>	0.70020	<b>0. 31034</b>	<b>0. 99375</b>	0.70020	<b>0. 99</b>	<b>0. 0522</b>	46
<b>White oak</b>	Green	<b>1. 36641</b>	<b>0. 76901</b>	<b>0. 32466</b>	<b>1. 06868</b>	<b>0. 76901</b>	<b>0. 99</b>	<b>0. 0409</b>	94
	Dry	<b>0. 87703</b>	<b>0. 76125</b>	<b>0. 24278</b>	<b>1. 02906</b>	<b>0. 76125</b>	<b>0. 99</b>	<b>0. 0410</b>	94
<b>All Species</b>	Green	<b>1. 74130</b>	0.72798	<b>0. 33623</b>	<b>1. 07091</b>	<b>0. 72798</b>	<b>0. 98</b>	0.0568	591
	Dry	<b>0. 98977</b>	0.72110	<b>0. 20564</b>	<b>1. 04875</b>	<b>0. 72110</b>	<b>0. 96</b>	<b>0. 0850</b>	590

<sup>1</sup>Trees < 11.0 inches d.b.h.

$$Y = a'(D^2H4)^b$$

<sup>2</sup>Trees ≥ 11.0 inches d.b.h.

$$Y = a''(D^2)^b (H4)^c$$

Where: Y = component weight in pounds

D = tree d.b.h. in inches

H4 = tree height to 4-inch top in feet

a', a'', b, c = regression coefficients

<sup>3</sup>log<sub>10</sub> form

**Table 17. --Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled			
		Trees < 11.0 in d.b.h. <sup>1</sup>			Trees > 11.0 in d.b.h. <sup>2</sup>								
		a'	b	a''	b	c							
<b>TOTAL TREE</b>													
Soft Hardwoods	Wd&Bk	<b>0. 04446</b>	<b>0.70786</b>	<b>0. 00723</b>	1.08651	<b>0. 70786</b>	0.99	0.0520	327				
	Wbod	0.03116	<b>0. 72981</b>	<b>0. 00593</b>	1.07591	<b>0. 72981</b>	0.99	<b>0. 0525</b>	327				
<b>Red maple</b>	Wd&Bk	0.03705	<b>0. 73314</b>	0.00508	1.14743	0.73314	0.98	<b>0. 0504</b>	24				
	Wbod	0.03028	<b>0. 74178</b>	0.00509	1.11338	0.74178	0.98	<b>0. 0477</b>	24				
Sweetgum	Wd&Bk	0.04903	<b>0. 69963</b>	0.00534	1.15293	0.69063	0.99	<b>0. 0493</b>	175				
	wood	<b>0. 03303</b>	<b>0. 71611</b>	<b>f-1. 00390</b>	1.16140	0.71611	0.99	<b>0. 0491</b>	175				
<b>Sycamore</b>	Wd&Bk	<b>0. 02214</b>	0.79638	<b>0. 01592</b>	0.86513	<b>0. 79638</b>	0.98	<b>0. 0585</b>	25				
	wood	0.01845	0.81137	<b>0. 91472</b>	0.85844	<b>0. 81137</b>	0.98	<b>0. 0590</b>	25				
<b>Yellow-poplar</b>	Wd&Bk	0.04631	0.70449	<b>0. 00699</b>	1.99877	0.70449	0.99	<b>0. 0418</b>	74				
	wood	0.03560	0.71187	<b>0. 00608</b>	1.08041	0.71187	0.99	<b>0. 0356</b>	74				
<b>Hard Hardwoods</b>	Wd&Bk	0.03763	0.74279	<b>0. 00420</b>	1.19992	0.74279	0.98	<b>0. 0627</b>	264				
	Wbod	0.02681	0.75856	<b>0. 00303</b>	1.21303	0.75856	0.98	<b>0. 0651</b>	264				
<b>Elm species</b>	Wd&Bk	0.03373	0.76474		-	-	0.96	<b>0. 0695</b>	8				
	Wbod	0.02450	0.75253		-	-	<b>0. 98</b>	<b>0. 0509</b>	a				
<b>Hickory species</b>	Wd&Bk	<b>0. 04393</b>	0.73463	<b>0. 00480</b>	<b>1. 19614</b>	0.73463	<b>0. 97</b>	<b>0. 0800</b>	la				
	Wood	0.02599	0.76123	<b>0. 00247</b>	<b>1. 25199</b>	0.76123	<b>0. 98</b>	<b>0. 0688</b>	18				
<b>Chestnut oak</b>	Wd&Bk	0.02745	0.77407		-	-	<b>0. 97</b>	<b>0. 0631</b>	25				
	Wbod	0.01999	0.78134		-	-	<b>0. 97</b>	<b>0. 0669</b>	25				
<b>Scarlet oak</b>	Wd&Bk	<b>0. 04061</b>	<b>0. 73977</b>	<b>0. 00380</b>	1.23403	<b>0. 73977</b>	<b>0. 97</b>	<b>0. 0678</b>	32				
	wood	<b>0. 03151</b>	0.74693	<b>0. 00282</b>	1.25037	0.74693	<b>0. 97</b>	<b>0. 0659</b>	32				
<b>South. red oak</b>	Wd&Bk	0.05657	0.67994	<b>0. 00336</b>	1.26862	<b>0. 67994</b>	<b>0. 99</b>	<b>0. 0579</b>	46				
	wood	0.04024	0.69298	<b>0. 00220</b>	1.29892	0.69298	<b>0. 99</b>	<b>0. 0585</b>	46				

**Table 17.--Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued**

Species or species group	Volume wood & bark Trees < 11.0 in or wood only	Regression equation coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled		
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	c					
White oak	Wd&Bk	<b>0. 02975</b>	<b>0. 77467</b>	<b>0. 00516</b>	1.13999	<b>0. 77467</b>	<b>0. 99</b>	<b>0. 0476</b>	94
	Wbd	<b>0. 02127</b>	<b>0. 79077</b>	<b>0. 00358</b>	<b>1. 16247</b>	<b>0. 79077</b>	<b>0. 99</b>	<b>0. 0445</b>	94
All Species	Wd&Bk	<b>0. 04300</b>	<b>0. 71848</b>	<b>0. 00576</b>	<b>1. 13779</b>	<b>0. 71848</b>	<b>0. 98</b>	<b>0. 0652</b>	591
	Wbd	<b>0. 03013</b>	<b>0. 73856</b>	<b>0. 00447</b>	<b>1. 13649</b>	<b>0. 73856</b>	<b>0. 98</b>	<b>0. 0641</b>	591

\* Trees < 11.0 inches d.b.h.

$$Y = a' (D^2 H4)^b$$

\* Trees > 11.0 inches d.b.h.

$$Y = a'' (D^2)^b (H4)^c$$

Where: Y = component volume in cubic feet

D = tree d.b.h. in inches

H4 = tree height to 4-inch top in feet

a', a'', b, c = regression coefficients

<sup>3</sup>log, <sub>0</sub> form

**Table 18. --Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients						Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>			a''	b	c		
<b>TOTAL STEM</b>										
Soft Hardwoods	Wd&Bk	0.03907	<b>0. 70612</b>	<b>0. 00887</b>	<b>1. 01517</b>	<b>0. 70612</b>	0.99	<b>0. 0461</b>	327	
	Wood	<b>0. 02773</b>	0.72879	<b>0. 00710</b>	<b>1. 01304</b>	<b>0. 72879</b>	0.99	<b>0. 0434</b>	327	
<b>Red maple</b>	Wd&Bk	0.03279	<b>0. 72602</b>	<b>0. 01353</b>	<b>0. 91057</b>	<b>0. 72602</b>	0.99	<b>0. 0282</b>	24	
	Wbod	<b>0. 02656</b>	<b>0. 73901</b>	<b>0. 01235</b>	<b>0. 89862</b>	<b>0. 73901</b>	0.99	<b>0. 0260</b>	24	
Sweetgum	Wd&Bk	0.04392	0.68974	<b>0. 00827</b>	<b>1. 03783</b>	<b>0. 68974</b>	0.99	<b>0. 0481</b>	175	
	Wbod	<b>0. 02981</b>	<b>0. 71653</b>	<b>0. 00576</b>	<b>1. 05919</b>	<b>0. 71653</b>	0.99	<b>0. 0478</b>	175	
<b>Sycamore</b>	Wd&Bk	<b>0. 02603</b>	<b>0. 75115</b>	<b>0. 01091</b>	<b>0. 93239</b>	<b>0. 75115</b>	0.99	0.0513	25	
	Wbod	<b>0. 02258</b>	<b>0. 76287</b>	0.01021	<b>0. 92846</b>	<b>0. 76287</b>	0.99	<b>0. 0508</b>	25	
<b>Yellow-poplar</b>	Wd&Bk	0.03569	<b>0. 72218</b>	0.00917	<b>1. 00549</b>	<b>0. 72218</b>	0.99	<b>0. 0420</b>	75	
	Wbod	<b>0. 02864</b>	0.72644	0.00770	1.00040	<b>0. 72644</b>	0.99	<b>0. 0349</b>	75	
Hard Hardwoods	Wd&Bk	0.03434	<b>0. 72578</b>	0.00825	<b>1. 03317</b>	<b>0. 72578</b>	0.99	<b>0. 0445</b>	264	
	Wood	0.02465	0.74494	0.00582	<b>1. 04584</b>	<b>0. 74494</b>	0.99	<b>0. 0497</b>	264	
<b>Elm species</b>	Wd&Bk	<b>0. 03122</b>	<b>0. 73147</b>				0.99	<b>0. 0174</b>	8	
	Wbod	<b>0. 02290</b>	<b>0. 75482</b>				0.99	<b>0. 0281</b>	8	
<b>Hickory species</b>	Wd&Bk	<b>0. 05130</b>	<b>0. 67784</b>	0.00580	<b>1. 13323</b>	<b>0. 67784</b>	0.99	<b>0. 0484</b>	18	
	Wood	<b>0. 02948</b>	<b>0. 71470</b>	0.00296	<b>1. 19380</b>	<b>0. 71470</b>	0.99	<b>0. 0452</b>	18	
<b>Chestnut oak</b>	Wd&Bk	<b>0. 02915</b>	0.74106				0.98	<b>0. 0462</b>	25	
	Wbod	0.02092	<b>0. 75433</b>				0.98	<b>0. 0487</b>	25	
<b>Scarlet oak</b>	Wd&Bk	0.03696	<b>0. 71620</b>	0.00649	1.07908	<b>0. 71620</b>	0.99	<b>0. 0360</b>	32	
	Wbod	<b>0. 02850</b>	<b>0. 72923</b>	0.00510	<b>1. 08817</b>	<b>0. 72923</b>	0.99	<b>0. 0378</b>	32	
<b>South. red oak</b>	Wd&Bk	<b>0. 04688</b>	0.68265	<b>9. 00832</b>	<b>1. 04325</b>	<b>0. 68265</b>	0.99	<b>0. 0494</b>	46	
	Wbod	<b>0. 03539</b>	0.69066	0.00504	<b>1. 09694</b>	0.69066	0.99	<b>0. 0487</b>	46	

**Table 18. --Regression equations for estimating cubic-foot volume of total-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and height to 4-inch top as independent variables--Continued**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>3</sup> (S <sub>y,x</sub> )	No. of trees sampled		
		Trees < 11.0 in d.b.h. <sup>1</sup>	Trees > 11.0 in d.b.h. <sup>2</sup>	a'	b	a''	b	c	
<b>White oak</b>	Wd&Bk	0.03008	<b>0. 74210</b>	0.00848	<b>1. 00605</b>	<b>0. 74210</b>	<b>U. 99</b>	<b>0. 0348</b>	<b>94</b>
	<b>Wod</b>	0.02110	<b>0. 76553</b>	0.00583	<b>1. 03378</b>	<b>0. 76553</b>	<b>0. 99</b>	<b>0. 0359</b>	
<b>All Species</b>	Wd&Bk	<b>0. 0372s</b>	<b>0. 71359</b>	0.00861	1.01890	<b>u. 71359</b>	<b>u. 99</b>	0.0460	<b>591</b>
	<b>Wod</b>	<b>0. 02650</b>	<b>0. 73508</b>	0.00654	<b>1. 02694</b>	0.73508	<b>0. 99</b>	<b>0. 0466</b>	

**'Trees < 11.0 inches d.b.h.**

$$Y = a'(D^2H^4)^b$$

**2Trees ≥ 11.0 inches d.b.h.**

$$Y = a''(D^2)^b (H^4)^c$$

Where: **Y** = component volume in cubic feet

**D** = tree d.b.h. in inches

**H4** = tree height to 4-inch top in feet

**a', a'', b, c** = regression coefficients

**<sup>3</sup>log<sub>10</sub> form**

**Table 19.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species** in the Piedmont, with d. b. h. and saw-log merchantable height as independent variables

Species or species group	Weight green or dry	Regression equation coefficients <sup>1</sup>			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>2</sup> (S <sub>y,x</sub> )	No. of trees sampled
<b>TOTAL-TREE WOOD, BARK, AND FOLIAGE</b>							
Soft Hardwoods	Green	<b>6. 16340</b>	1.06381	0.14075	0.88	<b>0. 0657</b>	123
	Dry	<b>3. 30431</b>	1.10629	0.04676	0.86	<b>0. 0685</b>	123
Sweetgum	Green	<b>4. 82876</b>	1.12408	0.11727	0.91	<b>0. 0552</b>	56
	Dry	<b>3. 08628</b>	1.12057	0.14936	0.90	<b>0. 11600</b>	56
Sycamore	Green	<b>39. 67031</b>	0.55215	0.41342	<b>0. 86</b>	<b>0. 0657</b>	15
	Dry	<b>20. 92329</b>	0.49255	0.45743	<b>0. 83</b>	<b>0. 0734</b>	15
Yellow-poplar	Green	<b>3. 69070</b>	1.12441	0.17196	0.92	<b>0. 0585</b>	40
	Dry	<b>2. 27508</b>	1.15141	<b>0. 07477</b>	0.90	<b>0. 0627</b>	40
<b>Hard Hardwoods</b>	Green	<b>2. 71418</b>	1.25757	0.12847	<b>0. 88</b>	<b>0. 0660</b>	98
	Dry	<b>1. 74397</b>	1.24211	0.12634	0.87	0.0697	98
Scarlet oak	Green	<b>5. 14653</b>	1.25279	-0.06827	0.97	<b>0. 0348</b>	16
	Dry	<b>4. 51906</b>	1.22648	-0.15867	0.96	<b>0. 0399</b>	lb
South-red oak	Green	<b>5. 74229</b>	1.13955	0.07902	0.92	0.0502	24
	Dry	<b>3. 42939</b>	1.13834	0.07467	0.91	0.0531	24
White oak	Green	<b>1. 63124</b>	1.39157	0.06708	0.93	0.0555	38
	Dry	1.06912	1.37123	0.06905	0.92	<b>0. 0597</b>	38
All Species	Green	<b>4. 90783</b>	1.19288	<b>0. 02969</b>	<b>0. 84</b>	<b>0. 0766</b>	221
	Dry	<b>3. 31791</b>	1.23516	<b>-0. 10229</b>	<b>0. 74</b>	<b>0. 1022</b>	221
<b>TOTAL-TREE WOOD AND BARK</b>							
Soft Hardwoods	Green	<b>5. 93717</b>	<b>1. 05516</b>	<b>0. 15325</b>	0.88	<b>0. 0652</b>	123
	Dry	3.16814	<b>1. 10332</b>	<b>0. 05787</b>	0.87	<b>0. 0682</b>	123
Sweetgum	Green	<b>4. 80892</b>	<b>1. 11113</b>	0.13135	<b>0. 91</b>	<b>0. 0557</b>	56
	Dry	2.04258	<b>1. 11675</b>	0.15718	<b>0. 90</b>	<b>0. 0603</b>	56
Sycamore	Green	<b>36. 02956</b>	<b>0. 55628</b>	<b>0. 42159</b>	0.86	<b>0. 0667</b>	15
	Dry	<b>19. 40042</b>	<b>0. 49456</b>	<b>U. 46638</b>	0.83	<b>0. 0741</b>	15
Yellow-poplar	Green	<b>3. 70426</b>	<b>1. 11862</b>	0.17242	0.92	<b>0. 0579</b>	40
	Dry	2.23925	<b>1. 15166</b>	0.07463	0.90	<b>0. 0629</b>	40
<b>Hard Hardwoods</b>	Green	<b>2. 63369</b>	1.24969	0.13904	0.88	<b>0. 0656</b>	98
	Dry	<b>1. 68788</b>	1.23604	0.13690	0.87	<b>0. 0690</b>	98
Scarlet oak	Green	4.34704	1.24727	-0.02093	0.97	<b>0. 0320</b>	16
	Dry	3.97479	1.21788	-0.11805	0.96	<b>0. 0371</b>	16

Continued

**Table 19.--Regression equations for estimating green and dry weight of above-stump total-tree wood, bark, and foliage, wood and bark combined, and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients <sup>1</sup>			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>2</sup> (S <sub>y,x</sub> )	No. of trees sampled
		a	b	c			
<b>South. red oak</b>	<b>Green</b>	<b>5. 81860</b>	<b>1. 12812</b>	<b>0. 08277</b>	<b>u. 92</b>	0.0497	<b>24</b>
	Dry	3. 45717	1. 13251	0. 07353	U. 92	0. 0519	24
<b>White oak</b>	<b>Green</b>	<b>1. 56640</b>	<b>1. 38649</b>	<b>0. 07660</b>	<b>0. 94</b>	<b>0. 0547</b>	<b>38</b>
	Dry	1. 01472	1. 36833	0. 08063	0. 93	0. 0584	38
<b>All Species</b>	<b>Green</b>	<b>4. 71974</b>	<b>1. 18466</b>	<b>0. 04426</b>	<b>0. 84</b>	0.0755	221.
	Dry	3.17469	1. 22898	-0. 08704	0. 74	0. 1005	221
<b>TOTAL-TREE WOOD</b>							
<b>Soft Hardwoods</b>	<b>Green</b>	<b>5. 33812</b>	<b>1. 03469</b>	<b>0. 17425</b>	<b>0. 85</b>	<b>0. 0735</b>	<b>123</b>
	Dry	2. 95691	1. 08784	0. 06027	0. 85	0. 0722	123
<b>Sweetgum</b>	<b>Green</b>	<b>4. 26547</b>	1. 10159	0. 14174	<b>11. 91</b>	<b>0. 0566</b>	56
	Dry	i .85726	1. 11531	0. 14506	0. 90	0. 0612	56
<b>Sycamore</b>	Green	34.88147	0.55564	<b>0. 41726</b>	<b>0. 85</b>	0.0685	<b>15</b>
	Dry	<b>18. 88130</b>	0.49271	0. 46035	0. 82	<b>0. 0769</b>	15
<b>Yellow-poplar</b>	<b>Green</b>	<b>2. 84055</b>	<b>1. 14182</b>	<b>0. 16022</b>	0. 92	<b>0. 0577</b>	40
	Dry	1. 85316	1. 18335	0. 03324	0. 90	0. 0615	40
<b>Hard Hardwoods</b>	<b>Green</b>	<b>1. 91965</b>	<b>1. 25217</b>	<b>0. 17663</b>	<b>0. 86</b>	<b>0. 0721</b>	<b>98</b>
	Dry	1. 27266	1. 23388	0. 17000	0. 84	0. 0779	98
<b>Scarlet oak</b>	<b>Green</b>	<b>3. 07600</b>	1. 25572	<b>0. 01875</b>	<b>0. 97</b>	0.0321	<b>16</b>
	Dry	3. 12229	1. 21079	-0. 08963	0. 96	0. 0376	16
<b>South. red oak</b>	Green	<b>4. 00847</b>	<b>1. 13728</b>	<b>U. 11847</b>	<b>0. 91</b>	0.0544	<b>24</b>
	Dry	2. 41552	1. 12809	0. 11878	0. 90	0.0582	24
<b>White oak</b>	<b>Green</b>	<b>1. 30013</b>	<b>1. 38510</b>	<b>0. 08872</b>	0. 93	0.0557	<b>38</b>
	Dry	0. 87' 537	1. 36221	0. 08849	0. 92	0. 0590	38
<b>All Species</b>	Green	3.89404	<b>1. 16792</b>	0.07993	0.83	<b>0. 0798</b>	221
	Dry	<b>2. 72403</b>	<b>1. 20958</b>	-0. 06022	0. 74	0.0998	221

$$^1Y = a(D^2)b(Mh)^c$$

Where: **Y** = component weight in pounds

D = tree d.b.h. in inches

Mh = tree saw-log merchantable height in feet

a,b,c = regression coefficients

$\log_{10}$  form

**Table 2U.** --Regression **equations** for estimating **green** and **dry** weight of saw-log merchantable-stein **wood** and bark combined **and wood alone** for hardwood **species in the Piedmont**, with d.b.h. and saw-log **merchantable height as independent variables**

Species or species group	Weight green or dry	Regression equation coefficients <sup>1</sup>			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>2</sup> (S <sub>y,x</sub> )	No. of trees sampled
<b>SAW LOG STEM WOOD AND BARK</b>							
Soft Hardwoods	Green	<b>0. 67595</b>	0.89328	0.85866	0.97	<b>0. 0430</b>	123
	Dry	0.36620	0.94121	0.75577	0.96	0.0522	133
Sweetgum	Green	0.65236	0.96221	9.77262	<b>0. 07</b>	0.0441	56
	Dry	<b>U. 28174</b>	0.95355	0.81101	0.96	<b>0. 0476</b>	56
Sycamore	Green	<b>1. 38050</b>	0.75171	0.87234	<b>0. 97</b>	0.0469	15
	Dry	0.73990	0.66517	0.95000	<b>0. 97</b>	0.0537	15
Yellow-poplar	Green	0.55649	0.94771	0.82697	0.98	0.0362	40
	Dry	0.33553	0.38999	0.71972	0.96	0.0479	40
<b>Hard Hardwoods</b>	Green	<b>0. 38692</b>	1.08711	0.76368	0.97	0.0368	98
	Dry	0.25507	1.05649	0.77399	<b>U. 96</b>	<b>0. 0400</b>	98
Scarlet oak	Green	<b>U. 28236</b>	1.16022	0.76264	0.98	<b>0. 0274</b>	16
	Dry	<b>0. 29759</b>	1.10027	0.66135	<b>0. 97</b>	0.0299	16
South. red oak	Green	<b>0. 49344</b>	1.00035	0.80825	<b>0. 98</b>	0.0328	24
	Dry	0.29400	0.98681	LJ.81718	<b>0. 98</b>	0.0360	24
White oak	Green	<b>0. 351304</b>	1.11465	0.75103	0.98	0.0288	38
	Dry	0.23828	1.07714	0.76684	0.98	0.0317	38
All Species	Green	<b>0. 55409</b>	1.02467	0.73488	<b>0. 95</b>	0.0520	221
	Dry	0.38056	1.05605	0.61383	0.88	0.0800	221
<b>SAW LOG STEM WOOD</b>							
Soft Hardwoods	Green	0.61760	<b>0. 89024</b>	<b>11. 85859</b>	0.97	0.0487	123
	Dry	<b>0. 35161</b>	<b>U. 43836</b>	0.74302	0.96	<b>0. 0527</b>	123
Sweetgum	Green	0.59993	<b>0. 96725</b>	<b>0. 76266</b>	<b>u. 97</b>	<b>0. 0441</b>	56
	Dry	<b>0. 26906</b>	<b>0. 96144</b>	<b>0. 78172</b>	0.96	0.0472	56
Sycamore	Green	<b>1. 31571</b>	0.75985	<b>0. 86343</b>	<b>0. 97</b>	0.0489	15
	Dry	0.70847	<b>0. 67292</b>	0.93861	<b>U. 96</b>	0.0566	15
Yellow-poplar	Green	<b>U. 42342</b>	0.99036	<b>0. 79729</b>	<b>11. 98</b>	0.0379	40
	Dry	<b>0. 27854</b>	<b>1. 040114</b>	<b>0. 65748</b>	<b>0. 96</b>	<b>0. 0492</b>	40
Hard Hardwoods	Green	<b>0. 23767</b>	1.09847	0.78450	0.95	0.0467	98
	Dry	0.20003	1.06247	0.79412	<b>u. 93</b>	<b>0. 0535</b>	98

*Continued*

**Table 20.--Regression equations for estimating green and dry weight of saw-log merchantable-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables--Continued**

Species or species group	Weight green or dry	Regression equation coefficients			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>2</sup> (S <sub>y,x</sub> )	No. of trees sampled
		a	b	c			
<b>Scarlet oak</b>	Green	0.23242	<b>1. 16362</b>	<b>0. 77546</b>	<b>0. 98</b>	<b>0. 0315</b>	<b>16</b>
	Dry	(J. 27482)	<b>1. 08420</b>	0.66505	<b>0. 97</b>	<b>0. 0340</b>	<b>16</b>
South. red <b>oak</b>	Green	0.36379	1.00704	0.83888	<b>0. 97</b>	<b>0. 0371</b>	<b>24</b>
	Dry	0.21906	0.97487	0.86472	0.97	<b>0. 0412</b>	<b>24</b>
<b>White oak</b>	Green	0.31177	<b>1. 12038</b>	<b>0. 74633</b>	<b>0. 98</b>	<b>0. 0315</b>	<b>38</b>
	Dry	0.21647	1.08001	0.75892	<b>0. 98</b>	<b>0. 0340</b>	<b>38</b>
<b>All Species</b>	Green	0.47426	1.02196	<b>0. 74970</b>	<b>0. 95</b>	<b>0. 0557</b>	<b>221</b>
	Dry	0.33963	<b>1. 04751</b>	<b>0. 67258</b>	<b>0. 89</b>	0.0785	<b>221</b>

$$Y = a(D^2)b(Mh)^c$$

Where: **Y** = component weight **in** pounds  
**D** = **tree d.b.h. in inches**  
**Mh** = tree saw-log merchantable height **in feet**  
 a,b,c=regression **coefficients**

$\log_{10}$  form

**Table 21. --Regression equations for estimating cubic-foot volume of above-stump total-tree wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables**

Species of <i>species</i> <i>group</i>	Volume wood & bark or wood only	Rey	Coefficient coefficients <sup>1</sup>			Standard error <sup>2</sup> (S <sub>y,x</sub> )	No. of trees sampled
			a	b	c		
<b>TOTAL TREE</b>							
Soft Hardwoods	Wd&Bk	0.10552	1.05509	0.13692	0.89	0.0626	23
	<b>Wood</b>	0.09583	1.03585	0.14745	0.88	0.0656	123
Sweetgum	Wd&Bk	0.09775	1.01130	0.21776	0.91	0.0557	56
	<b>Wood</b>	0.08137	1.01485	0.21996	U.91	0.0558	56
Sycamore	Wd&Bk	0.78170	0.52890	0.37297	0.87	<b>0.0596</b>	15
	<b>Wood</b>	0.76002	0.52710	<b>0.36990</b>	0.86	0.0611	15
<b>Yellow-poplar</b>	Wd&Bk	0.06004	1.08702	0.24020	0.92	0.0589	40
	<b>Wood</b>	0.05114	1.09195	0.21951	0.93	0.0539	40
<b>Hard Hardwoods</b>	Wd&Bk	0.05063	1.22643	0.10976	<b>0.89</b>	0.0620	98
	<b>Wood</b>	0.03736	1.22635	0.14310	0.88	0.0640	98
<b>Scarlet oak</b>	Wd&Bk	0.08119	1.22826	-0.05300	0.99	0.0224	16
	<b>Wood</b>	0.05943	1.22990	-0.01538	0.99	0.0204	16
South. red <b>oak</b>	Wd&Bk	0.10323	1.15006	0.00785	0.95	0.0398	24
	<b>Wood</b>	0.07019	1.16638	0.03432	0.95	0.0404	24
<b>White oak</b>	Wd&Bk	0.02510	1.36610	0.08975	0.93	0.0550	38
	<b>Wood</b>	0.02019	1.36957	0.09664	0.93	0.0549	38
<b>All Species</b>	Wd&Bk	0.08168	1.15697	<b>0.06573</b>	0.88	0.0654	221
	<b>Wood</b>	0.06856	1.13968	0.09215	0.87	0.0668	2 2 1

$$^1 Y = a(D^2)^b(Mh)^c$$

Where : **Y** = component volume in cubic feet

**D** = tree d.b.h. in inches

**Mh** = saw-log merchantable height in feet

a,b,c = regression coefficients

$2 \log_{10}$  form

**Table 22. --Regression equations for estimating cubic-foot volume of saw-log merchantable-stem wood and bark combined and wood alone for hardwood species in the Piedmont, with d.b.h. and saw-log merchantable height as independent variables**

Species or species group	Volume wood & bark or wood only	Regression equation coefficients <sup>1</sup>			Coefficient of determination (R <sup>2</sup> )	Standard error <sup>2</sup> (S <sub>y,x</sub> )	Number trees sampled (N)
		a	b	c			
<b>SAW LOG STEM</b>							
<b>Soft Hardwoods</b>	Wd&Bk	0.01266	<b>0. 88987</b>	<b>0. 83274</b>	0.97	<b>0. 0431</b>	<b>121</b>
	<b>Wbod</b>	0.01179	<b>0. 89346</b>	<b>0. 81166</b>	0.98	<b>0. 0388</b>	<b>121</b>
<b>Sweetgum</b>	Wd&Bk	0.01485	<b>0. 79949</b>	<b>0. 91861</b>	<b>0. 96</b>	0.0434	<b>55</b>
	<b>Wbod</b>	0.01307	<b>0. 84055</b>	<b>0. 86088</b>	0.97	<b>0. 0424</b>	<b>55</b>
<b>Sycamore</b>	Wd&Bk	0.02732	<b>0. 71993</b>	0.85113	0.99	0.0316	<b>15</b>
	<b>Wbod</b>	0.02618	<b>0. 72769</b>	0.84192	0.99	0.0329	<b>15</b>
<b>Yellow-poplar</b>	Wd&Bk	0.01022	<b>0. 90924</b>	0.87248	<b>0. 98</b>	<b>0. 0362</b>	<b>40</b>
	<b>Wbod</b>	0.00871	<b>0. 94012</b>	0.82258	0.98	<b>0. 0339</b>	<b>40</b>
<b>Hard Hardwoods</b>	Wd&Bk	0.00874	<b>1. 04386</b>	<b>0. 71872</b>	0.97	0.0340	<b>96</b>
	Wood	0.00631	<b>1. 06217</b>	<b>0. 74366</b>	0.97	0.0365	<b>96</b>
<b>Scarlet oak</b>	Wd&Bk	0.00519	<b>1. 14668</b>	0.72612	0.98	0.0258	<b>16</b>
	<b>Wbod</b>	0.00457	<b>1. 14295</b>	0.73007	0.98	0.0268	<b>16</b>
<b>South. red oak</b>	Wd&Bk	0.01310	<b>1. 01034</b>	<b>0. 63959</b>	<b>0. 98</b>	0.0262	<b>22</b>
	Wood	0.00702	<b>1. 04172</b>	<b>0. 72127</b>	<b>0. 98</b>	0.0277	<b>22</b>
<b>White oak</b>	Wd&Bk	0.00574	<b>1. 07881</b>	0.77957	<b>0. 98</b>	0.0279	<b>38</b>
	Wood	0.00496	<b>1. 09295</b>	<b>0. 76519</b>	<b>0. 98</b>	0.0293	<b>38</b>
<b>All Species</b>	Wd&Bk	0.01076	<b>0. 98684</b>	0.73947	<b>0. 96</b>	0.0421	<b>217</b>
	Wood	0.00905	<b>0. 98897</b>	0.74695	0.97	0.0398	<b>217</b>

$$Y = a(D^2)^b(Mh)^c$$

Where: **Y** = component volume in cubic feet

**D** = tree d.b.h. in inches

**Mh** = saw-log merchantable height in feet

**a,b,c** = regression coefficients

<sup>2</sup>log<sub>10</sub> form

**Table 23. --Regression coefficients for estimating above-stump stem weight to a specified d.o.b. top diameter as a proportion of total-stem weight for hardwood species in the Piedmont**

Species	<u>Regression equation and coefficients'</u>					
	Green weight			Dry weight		
	a	b	c	a	b	c
<b>WOOD AND BARK</b>						
<b>Soft Hardwoods</b>	<b>-1. 73265</b>	<b>4. 21073</b>	<b>-4. 28793</b>	<b>-1. 61846</b>	<b>4. 16572</b>	<b>-4. 21583</b>
<b>Red maple</b>	<b>-0. 80857</b>	<b>4. 37677</b>	<b>-4. 10402</b>	<b>-0. 76750</b>	<b>4. 32891</b>	<b>-4. 04315</b>
Sweetgum	-1.88706	4.09280	-4.20271	-1.70312	4.00522	-4.07778
Sycamore	<b>-2. 31104</b>	<b>4. 80579</b>	<b>-4. 88417</b>	<b>-2. 30869</b>	<b>4. 75038</b>	<b>-4. 83810</b>
<b>Yellow-poplar</b>	<b>-1. 72938</b>	<b>3. 99726</b>	<b>-4. 17198</b>	<b>-1. 76210</b>	<b>4. 04115</b>	<b>-4. 21537</b>
<b>Hard Hardwoods</b>	<b>-2. 61988</b>	<b>3. 92928</b>	<b>-4. 33719</b>	<b>-2. 48096</b>	<b>3. 90016</b>	<b>-4. 28540</b>
<b>Elm</b>	<b>-5. 22488</b>	<b>4. 41024</b>	<b>-4. 91101</b>	<b>-1. 85693</b>	<b>4. 17785</b>	<b>-4. 19195</b>
<b>Hickory</b>	<b>-9. 21973</b>	<b>4. 07639</b>	<b>-5. 02575</b>	<b>-8. 75055</b>	<b>4. 05001</b>	<b>-4. 97494</b>
<b>Chestnut oak</b>	<b>-1. 26318</b>	<b>4. 69218</b>	<b>-4. 69208</b>	<b>-1. 21241</b>	<b>4. 73014</b>	<b>-4. 70501</b>
<b>Scarlet oak</b>	-4.43019	<b>3. 68458</b>	<b>-4. 45247</b>	<b>-4. 07170</b>	<b>3. 59590</b>	<b>-4. 33080</b>
<b>South. red oak</b>	<b>-2. 013555</b>	3.49897	<b>-3. 80231</b>	-1.99820	<b>3. 47308</b>	<b>-3. 75484</b>
<b>White oak</b>	-1.99440	<b>3. 91077</b>	-4.20029	<b>-1. 91277</b>	<b>3. 93041</b>	-4.19809
<b>All Species</b>	<b>-2. 2513013</b>	4.00280	<b>-4. 27579</b>	<b>-2. 10544</b>	3.94825	<b>-4. 19553</b>
<b>WOOD ONLY</b>						
<b>Soft Hardwoods</b>	<b>-1. 64304</b>	4.32869	<b>-4. 38440</b>	<b>-1. 55017</b>	<b>4. 23574</b>	<b>-4. 27228</b>
<b>Red maple</b>	<b>-0. 763131</b>	<b>4. 44335</b>	<b>-4. 15466</b>	<b>-0. 73261</b>	4.36080	-4.05919
Sweetgum	<b>-1. 80721</b>	<b>4. 20935</b>	-4.30469	<b>-1. 65108</b>	<b>4. 08554</b>	<b>-4. 15193</b>
<b>Sycamore</b>	-2.25912	4.86204.	-4.92667	-2.28046	4.80799	-4.88602
<b>Yellow-poplar</b>	<b>-1. 64012</b>	<b>4. 11183</b>	<b>-4. 26807</b>	-1.71038	4.11441	<b>-4. 28153</b>
<b>Hard Hardwoods</b>	<b>-2. 62600</b>	<b>4. 03635</b>	<b>-4. 44620</b>	<b>-2. 49497</b>	<b>3. 99040</b>	-4.37918
<b>Elm</b>	-5.21153	<b>4. 6' 3413</b>	<b>-5. 10523</b>	<b>-0. 56432</b>	<b>3. 52387</b>	<b>-3. 07702</b>
<b>Hickory</b>	<b>-9. 20932</b>	<b>4. 13856</b>	<b>-5. 09267</b>	<b>-8. 62935</b>	4.08077	-5.00432
<b>Chestnut oak</b>	-1.235713	4.86497	<b>-4. 85131</b>	<b>-1. 19487</b>	<b>4. 87213</b>	<b>-4. 83716</b>
<b>Scarlet oak</b>	<b>-4. 47632</b>	<b>3. 79397</b>	-4.56449	-4.08401	<b>3. 68907</b>	<b>-4. 42364</b>
<b>South. red oak</b>	<b>-2. 16525</b>	<b>3. 56959</b>	<b>-3. 89161</b>	<b>-2. 07378</b>	<b>3. 53706</b>	<b>-3. 83789</b>
<b>White oak</b>	-1.90161	<b>4. 04669</b>	<b>-4. 31434</b>	<b>-1. 85655</b>	4.04282	-4.29760
<b>All Species</b>	<b>-2. 21362</b>	<b>4. 11130</b>	-4.37739	<b>-2. 06611</b>	<b>4. 02166</b>	<b>-4. 26466</b>

' Where:  $Y_R$  = **stem weight to top d.o.b./total-stem weight ratio**

d = **stem specified top d. o. b. in inches**

D = **tree d.b.h. in inches**

a,b,c = **regression coefficients**

e = **2. 71828 (base of log E)**

**Table 24.--Regression coefficients for estimating above-stump stem volume to a specified d.o.b. top diameter as a proportion of total-stem volume for hardwood species in the Piedmont**

Species	Regression equation and coefficients <sup>1</sup>					
	Wood and bark			Wood only		
	a	b	c	a	b	c
<b>Soft Hardwoods</b>						
Red maple	-0.63491	4.07791	-3.74763	-0.72033	4.38479	-4.07700
Sweetgum	-1.71771	4.08636	-4.16133	-1.09648	4.18535	-4.06573
Sycamore	-2.51196	4.72070	-4.84581	-1.47346	4.87589	-4.76297
Yellow-poplar	-1.76181	3.97649	-4.16652	-1.58270	4.11066	-4.25600
<b>Hard Hardwoods</b>						
Elm	-2.69221	3.89875	-4.32412	-1.58802	3.89439	-4.10976
Hickory	-5.53946	4.23262	-4.74186	-2.34516	4.07233	-4.26508
Chestnut oak	-9.21461	4.04604	-4.99672	-9.06779	4.18420	-5.12879
Scarlet oak	-4.61107	3.52799	-4.33254	-4.63561	3.61479	-4.42350
South. red oak	-2.20401	3.4317-L	-3.77125	-1.47631	3.48332	-3.66336
White oak	-2.17082	3.89490	-4.21939	-1.47760	4.03096	-4.19762
<b>All Species</b>	<b>-2.21693</b>	3.94846	<b>-4.22458</b>	<b>-1.413712</b>	<b>4.02485</b>	<b>-4.10951</b>

'Where:  $Y_R$  = stem volume to top d.o.b./total-stem **volume ratio**

d = stem **specified top d.o.b. in inches**

D = **tree d.b.h. in inches**

a,b,c = **regression coefficients**

e = 2.71828 (base of log E)

**Table 25.** --Regression **coefficients** for estimating **stem weight to a specified d. o. b. top diameter as a proportion of saw-log stem weight for hardwood species in the Piedmont**

Species	<b>Ratio equation and coefficients'</b>						
	<b>Green weight</b>			<b>Dweight</b>			
	<b>a</b>	<b>b</b>	<b>c</b>		<b>a</b>	<b>b</b>	<b>c</b>
<b>WOOD AND BARK</b>							
<b>Soft Hardwoods</b>	34.56311	-1.33687	<b>0. 34540</b>	<b>36. 21735</b>	-1.34421	<b>0. 34571</b>	
Sweetgum	22.04668	-1.202813	<b>U. 3843'3</b>	<b>26. 47795</b>	-1.24399	<b>0. 37862</b>	
Sycamore	7.67301	-0.86241	<b>0. 34220</b>	<b>10. 50581</b>	-0.94737	<b>0. 33595</b>	
<b>Yellow-poplar</b>	39.47929	-1.42104	<b>0. 35509</b>	<b>53. 62409</b>	-1.50445	<b>0. 34681</b>	
<b>Hard Hardwoods</b>	22.66546	<b>-1. 26307</b>	0.36865	24.38559	-1.28056	0.37474	
<b>Scarlet oak</b>	31.73326	-1.46549	0.36536	40.61327	-1.53417	0.38247	
<b>South. red oak</b>	12.89559	<b>-1. 07185</b>	0.34506	15.08843	-1.11120	0.35535	
<b>White oak</b>	27.61815	-1.33589	0.34312	30.11002	-1.35715	0.35120	
<b>All Species</b>	29.74533	-1.31912	0.35749	31.51398	-1.33074	0.36034	
<b>WOOD ONLY</b>							
<b>Soft Hardwoods</b>	35.62364	-1.35443	<b>0. 34231</b>	<b>37. 33020</b>	-1.36146	0.34311	
Sweetgum	22.10232	-1.21539	<b>0. 38254</b>	26.88392	-1.26047	0.37755	
<b>Sycamore</b>	7.28473	-0.85025	<b>0. 34122</b>	10.05026	-0.93713	0.33558	
<b>Yellow-poplar</b>	39.90690	-1.43386	0.35307	<b>53. 66090</b>	-1.51241	0.34454	
<b>Hard Hardwoods</b>	22.47899	<b>-1. 26624</b>	0.36449	22.69238	<b>-1. 26472</b>	<b>0. 36656</b>	
<b>Scarlet oak</b>	<b>3U. 44735</b>	<b>-1. 45626</b>	<b>0. 36327</b>	<b>29. 27276</b>	<b>-1. 43826</b>	<b>0. 36488</b>	
<b>South. red oak</b>	<b>12. 83823</b>	<b>-1. 07783</b>	0.34287	<b>13. 33679</b>	<b>-1. 08426</b>	<b>0. 34322</b>	
<b>White oak</b>	<b>27. 40217</b>	<b>-1. 33931</b>	<b>0. 33906</b>	<b>27. 27263</b>	<b>-1. 33482</b>	0.33971	
<b>All Species</b>	30.20095	<b>-1. 33096</b>	0.35380	<b>31. 29464</b>	<b>-1. 33593</b>	<b>0. 35547</b>	

<sup>1</sup>Where:  $Y_R = \text{ratio of stem weight or volume to top d. o. b. saw-log stem}$

Mh = saw-log **merchantable height in feet**

**d** = stem **specified top diameter in inches**

**D** = tree **d. b. h. in inches**

.78 = **constant based on average form class**

**a, b, c** = **regression coefficients**

**e** = **2. 71828 (base of log E)**

**Table 26. --Regression coefficients for estimating stem volume to a specified d. o. b. top diameter as a proportion of saw-log stem volume for hardwood species in the Piedmont**

<b>Species</b>	<b>Ratio equation and coefficients'</b>						
	<b>Wood and bark</b>			<b>Wbd only</b>			
	<b>a</b>	<b>b</b>	<b>I</b>	<b>c</b>	<b>a</b>	<b>b</b>	<b>c</b>
<b>Soft Hardwoods</b>	<b>30. 25414</b>	<b>- 1. 30210</b>	<b>0. 35021</b>		<b>30. 74283</b>	<b>- 1. 31681</b>	<b>0. 347. 72</b>
Sweetgum	<b>18. 57750</b>	<b>- 1. 15491)</b>	<b>0. 38851</b>		<b>18. 42347</b>	<b>- 1. 16620</b>	<b>0. 38709</b>
Sycamore	<b>7. 50334</b>	<b>- 0. 86564</b>	<b>0. 34172</b>		<b>7. 01438</b>	<b>- 0. 85009</b>	<b>0. 33987</b>
Yellow poplar	<b>32. 37729</b>	<b>- 1. 37255</b>	<b>0. 36225</b>		<b>31. 45762</b>	<b>- 1. 37480</b>	<b>0. 36010</b>
<b>Hard Hardwoods</b>	<b>21. 59218</b>	<b>- 1. 25535</b>	<b>0. 37171</b>		21.07918	-1.25541	0.36717
Scarlet oak	<b>32. 87656</b>	<b>- 1. 48776</b>	<b>0. 36335</b>		<b>29. 65145</b>	<b>- 1. 46143</b>	<b>0. 36113</b>
South. red oak	<b>10. 39703</b>	<b>- 1. 01780</b>	<b>0. 34439</b>		<b>10. 16607</b>	<b>- 1. 02040</b>	<b>0. 34157</b>
White oak	<b>27. 13415</b>	<b>- 1. 33679</b>	<b>0. 34275</b>		<b>26. 38838</b>	<b>- 1. 33583</b>	<b>0. 33833</b>
<b>All Species</b>	26.87548	-1.29436	0.36165		26.90075	-1.30344	0.35830

'Where:  $Y_R = \text{ratio of stem weight or volume to top d. o. b. saw-log stem}$

$M_h = \text{saw-log merchantable height in feet}$

$d = \text{stem specified top diameter in inches}$

$D = \text{tree d. b. h. in inches}$

.78 = **constant based on average form class**

a,b,c = **regression coefficients**

e = **2. 71828 (base of log E)**

**Clark, Alexander, III; Phillips, Douglas R.; Frederick, Douglas J.**  
Weight, volume, and physical properties of major hardwood species  
in the Piedmont. Res. Pap. X-255. Asheville, NC: U.S. Department  
of Agriculture, Forest Service, Southeastern Forest Experiment  
Station; 1985. 78 pp.

The weight, volume, and physical properties of trees 1 to 20  
inches d.b.h. were determined for red maple, sweetgum, sycamore,  
yellow-poplar, elm, hickory, chestnut oak, scarlet oak, southern  
red oak, and white oak in the Piedmont. Hard hardwoods, soft  
hardwoods, and individual species equations are presented for  
predicting green and dry weight and green volume of the total tree  
above stump and its components by using d.b.h. and total height,  
d.b.h. and height to a 4-inch top, d.b.h. and saw-log merchantable  
height, and d.b.h. alone. Average specific gravity, moisture  
content, and weight per cubic foot of wood, bark, and wood and  
bark combined are presented for each species by tree size class  
and component. Bark percentage is also presented for each species  
by tree size class and component.

**Keywords:** Biomass, equations, specific gravity, moisture content,  
bark percentage, weight per cubic foot.

**Clark, Alexander, III; Phillips, Douglas R.; Frederick, Douglas J.**  
Weight, volume, and physical properties of major hardwood species  
in the Piedmont. Res. Pap. X-255. Asheville, NC: U.S. Department  
of Agriculture, Forest Service, Southeastern Forest Experiment  
Station; 1985. 78 pp.

The weight, volume, and physical properties of trees 1 to 20  
inches d.b.h. were determined for red maple, sweetgum, sycamore,  
yellow-poplar, elm, hickory, chestnut oak, scarlet oak, southern  
red oak, and white oak in the Piedmont. Hard hardwoods, soft  
hardwoods, and individual species equations are presented for  
predicting green and dry weight and green volume of the total tree  
above stump and its components by using d.b.h. and total height,  
d.b.h. and height to a 4-inch top, d.b.h. and saw-log merchantable  
height, and d.b.h. alone. Average specific gravity, moisture  
content, and weight per cubic foot of wood, bark, and wood and  
bark combined are presented for each species by tree size class  
and component. Bark percentage is also presented for each species  
by tree size class and component.

**Keywords:** Biomass, equations, specific gravity, moisture content,  
bark percentage, weight per cubic foot.



The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives -as directed by Congress-to provide increasingly greater service to a growing Nation.

USDA policy does not permit discrimination because of race, color, national origin, sex or religion. Any person who believes he or she has been discriminated against in any USDA-related activity should write immediately to the Secretary of Agriculture, Washington, D.C. 20250.